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Tina Kotek, Governor

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November 22, 2024

Ryan Hill
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NextEra Energy Resources

Sent via email: Carrie.Konkol@tetratech.com; Ryan.Hill@nextenergy.com; sara.twitchell@nexteraenergy.com; melissa.hochmuth@nexteraenergy.com; carrie.andrews@tetratech.com; kristen.gulick@tetratech.com; sarah.curtiss@stoel.com

Re: Oregon Department of Energy's Determination on Wagon Trail Solar's Amendment Determination Request re: Battery Technology Change

Dear Mr. Hill,

On October 30, 2024, the Oregon Department of Energy (ODOE or the Department) received an Amendment Determination Request (ADR) regarding the Wagon Trail Solar Project, requesting a determination of whether a site certificate amendment would be needed to change a portion of the battery energy storage system (BESS) from lithium-ion to zinc electrolyte-based, long duration Eos energy storage.

Under OAR 345-027-0357, a certificate holder may submit an ADR to the Department for a determination of whether a proposed change requires an amendment to a site certificate. The rule requires that the ADR describe the proposed change, evaluate the determination being requested (e.g., if the certificate holder believes an amendment is not required, explain why) and provide any additional information that may assist the Department's evaluation.

The Department reviewed the ADR and supplemental information received on November 15, 2024 and has determined that the certificate holder provided information required under OAR 345-027-0357(4). As discussed in the attached evaluation, the Department **agrees that the circumstances described do not require an amendment to the Site Certificate under OAR 345-027-0350.**

Please note that, pursuant to OAR 345-027-0357(6), at the request of a member of the Energy Facility Siting Council (EFSC or Council), the Department's determination must be referred to the Council for concurrence, modification or rejection. In compliance with this rule, the Department will provide its determination to EFSC, informing Council members of their ability to review the Department's determination. Should a Council member request to review the determination, Council would likely conduct that review at its January 16-17, 2024 meeting.

If you have any questions, please contact me.
Sincerely,

Sarah Esterson, Senior Policy Advisor
Oregon Department of Energy
E: sarah.esterson@energy.oregon.gov
P: (503) 385-6128

cc: Todd Cornett, Assistant Director of Siting, Oregon Department of Energy
Patrick Rowe, Assistant Attorney General, Oregon Department of Justice

Attachments:

Attachment 1: Staff Evaluation and Determination
Attachment 2: Amendment Determination Request (Dated November 2024, submitted October 30, 2024)
Attachment 3: Certificate Holder Responses to Department Preliminary Review of ADR (November 19, 2024)

Attachment 1: Staff Evaluation and Determination

Background and Description of Proposed Change

Wagon Trail Solar Project is an approved, not yet constructed, 500 megawatt (MW) solar photovoltaic energy generation facility in Morrow County, Oregon. The site certificate authorizes the facility footprint to occupy or use up to 3,684 acres (5.7 sq. miles). Related or supporting facilities approved by Council include a 500 MW battery energy storage system (BESS) with lithium-ion batteries; a power collection system; up to two substations; an operation and maintenance building; Generator Step Up (GSU) transformer; 0.6 mile overhead 230 kV transmission line; perimeter fencing, access roads and staging areas.

On October 30, 2024, the Department received an Amendment Determination Request (ADR) explaining that Wagon Trail Energy Center, LLC (certificate holder) seeks to change a portion of the proposed BESS technology (up to 15 MW in the approved 500 MW system) from lithium-ion to zinc electrolyte-based, long duration Eos energy storage. The change in technology will not add any acreage to the site boundary and the location, footprint and dimensions of the BESS will be the same.[1]

Scope of Review

Under OAR 345-027-0357, a certificate holder may submit an ADR to the Department for a determination of whether a proposed change requires an amendment to a site certificate under OAR 345-027-0350.

Per OAR 345-027-0350, an amendment to a site certificate is required to:

> *(1) Transfer ownership of the facility or the certificate holder as described in OAR 345-027-0400;*
>
> *(2) Apply later-adopted laws as described in OAR 345-027-0390;*
>
> *(3) Extend the construction beginning or completion deadline as described in OAR 345-027-0385;*
>
> *(4) Design, construct, or operate a facility in a manner different from the description in the site certificate, if the proposed change:*
>
> > *(a) Could result in a significant adverse impact that the Council has not addressed in an earlier order and the impact affects a resource or interest protected by an applicable law or Council standard;*
> >
> > *(b) Could impair the certificate holder's ability to comply with a site certificate condition; or*
> >
> > *(c) Could require a new condition or a change to a condition in the site certificate.*

Subsections (1), (2) and (3) are not applicable to this ADR. For the reasons discussed below, the Department has determined the proposed change in battery technology does not trigger a need for an amendment under subsection (4).

[1] See Attachment 2, ADR, p. 4 Section 2.0.

Evaluation

The proposed change would not require review through the site certificate amendment process based on an evaluation of the "three coulds".

Per OAR 345-027-0350(4), an amendment to a site certificate is required if:

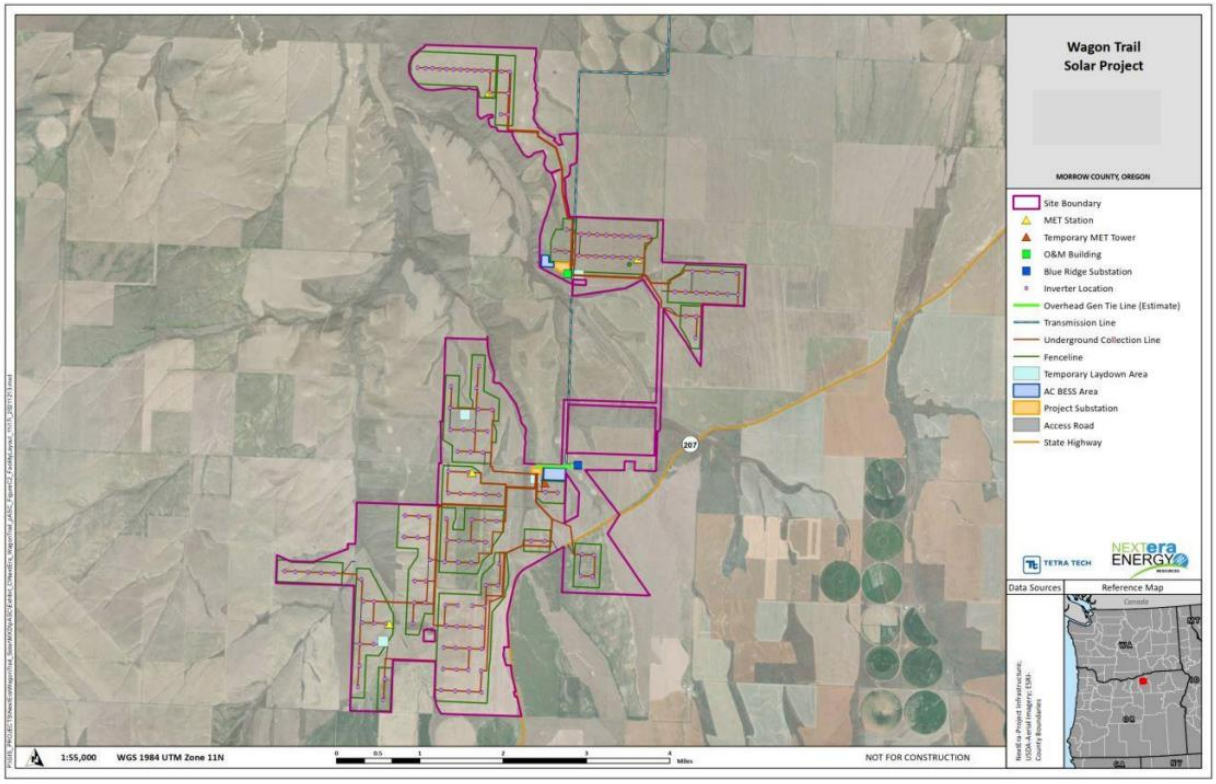
> *(4) Design, construct, or operate a facility in a manner different from the description in the site certificate, if the proposed change:*
>
> > *(a) Could result in a significant adverse impact that the Council has not addressed in an earlier order and the impact affects a resource or interest protected by an applicable law or Council standard;*
> >
> > *(b) Could impair the certificate holder's ability to comply with a site certificate condition; or*
> >
> > *(c) Could require a new condition or a change to a condition in the site certificate.*

The Department often refers to (4)(a), (b) and (c) as "the three coulds." In the ADR Table 1, the certificate holder addresses each of the Council's standards and explains why the proposed change in battery technology would not affect Council's previous findings. The Department agrees with that analysis and will not repeat it here. The Department also sets forth the following evaluation, further explaining why a site certificate amendment is not needed.

OAR 345-027-0350(4)(a)

There is nothing about changing a portion of the battery technology that could result in a significant adverse impact to a resource or interest that Council has not already addressed. The site boundary and the footprint, dimensions and location of the BESS will be the same as previously reviewed and approved by the Council. (See Figure 1 from the Final Order, copied below. The BESS Areas are depicted in blue). Therefore, the proposed change would not have any impact Council has not previously addressed regarding Council standards that require assessment of the impact of a facility based on its size or location (e.g., the Structural Standard, Land Use, Protected Areas, Fish and Wildlife Habitat, Threatened and Endangered Species, Scenic Resources, Historic, Cultural or Archaeological Resources, Recreation). Nor would it have an impact Council has not previously addressed with regard to any other standard, as explained by the certificate holder in the ADR Table 1.

Figure 1: Proposed Site Boundary and Facility Layout



OAR 345-027-0350(4)(b) and (c) – whether the proposed change could impact the certificate holder's ability to comply with a site certificate condition, require a new condition or a change to a condition in the site certificate.

The change in technology from lithium-ion to zinc electrolyte-based batteries would not impact the certificate holder's ability to comply with existing site certificate conditions or require a change to an existing condition.

The following conditions reference the battery storage system.

GEN-GS-06 subsection c. requires the certificate holder to design the battery storage system in accordance with the requirements of the National Fire Protection Association's (NFPA) 855: Standard for the Installation of Stationary Energy Storage Systems (NFPA, 2020) or most current version. The certificate holder has confirmed that including zinc electrolyte batteries would not impact its ability to comply with NFPA 855.[2] And this condition does not need to be changed as it is broad enough to cover any type of battery technology.

GEN-OE-03 requires the certificate holder to contractually require its third-party contractor used to transport and dispose battery and battery waste to comply with federal regulations and manufacturer recommendations. This condition does not need to be changed as it is broad enough to cover any type of battery technology.

[2] Attachment 3, p. 2.

PRO-WM-01 requires that, prior to facility operation, the certificate holder submit to the Department an Operational Waste Management Plan that, at a minimum, includes, among other items, a description of battery replacement procedures and identifies a final recycling destination facility of program for lithium-ion batteries. While that condition specifically references lithium-ion batteries, it is broad enough to capture the zinc electrolyte batteries because it says the Operational Waste Management Plan "at a minimum" must include the information described and subsection a. requires the certificate holder to identify all sources and quantities of operational waste and estimated quantities that can be recycled. As the certificate holder has noted, when the Operational Waste Management Plan is developed prior to operations, relevant battery technologies and associated measures shall be addressed as applicable.[3] The condition also provides the Department review and approval authority, intended to ensure that the final plan appropriately and adequately addresses any waste type generated during and from facility operations and that is based on final facility design.

Finally, the change in BESS technology would not require a new condition because the footprint, dimensions and location of the BESS will be the same as previously reviewed and approved by the Council and existing conditions sufficiently address the BESS regardless of the type of batteries used.

Determination

For the reasons discussed above, the Department determines that the proposed change in a portion of the BESS from lithium-ion to zinc electrolyte batteries would not require an amendment to the Wagon Trail Solar Project Site Certificate.

[3] Attachment 3, p. 2.

Attachment 2: Certificate Holder's Amendment Determination Request

ESTERSON Sarah * ODOE

From: Sarah.ESTERSON@energy.oregon.gov
Subject: Wagon Trail Solar Project - Amendment Determination Request
Attachments: Wagon Trail_Substation and BESS Technology_ADR_20241030.pdf

---

From: Konkol, Carrie <Carrie.Konkol@tetratech.com>
Sent: Wednesday, October 30, 2024 7:53 AM
To: ESTERSON Sarah * ODOE <Sarah.ESTERSON@energy.oregon.gov>
Cc: Hill, Ryan <Ryan.Hill@nexteraenergy.com>; Twitchell, Sara <Sara.Twitchell@nexteraenergy.com>; Hochmuth, Melissa <Melissa.Hochmuth@nexteraenergy.com>; Andrews, Carrie <CARRIE.ANDREWS@tetratech.com>; Gulick, Kristen <Kristen.Gulick@tetratech.com>; Curtiss, Sarah Stauffer <sarah.curtiss@stoel.com>; MCVEIGH-WALKER Chase * ODOE <Chase.MCVEIGH-WALKER@energy.oregon.gov>
Subject: RE: Wagon Trail Solar Project - Amendment Determination Request

Hi Sarah,

Thank you for your feedback regarding the Wagon Trail ADR. Attached is a revised version of the ADR that removes the request to add an area to the site boundary.

Please let us know if you have any questions.

Thanks,
Carrie

Carrie Konkol | Vice President, Senior Project Manager, Pacific Offshore Energy Lead
Direct **(503) 721-7225** | Mobile **(503) 830-8587** | carrie.konkol@tetratech.com

TETRA TECH

From: Konkol, Carrie <Carrie.Konkol@tetratech.com>
Sent: Thursday, October 17, 2024 10:57 AM
To: MCVEIGH-WALKER Chase * ODOE <Chase.MCVEIGH-WALKER@energy.oregon.gov>; ESTERSON Sarah * ODOE <Sarah.ESTERSON@energy.oregon.gov>
Cc: Hill, Ryan <Ryan.Hill@nexteraenergy.com>; Twitchell, Sara <Sara.Twitchell@nexteraenergy.com>; Hochmuth, Melissa <Melissa.Hochmuth@nexteraenergy.com>; Andrews, Carrie <CARRIE.ANDREWS@tetratech.com>; Gulick, Kristen <Kristen.Gulick@tetratech.com>; Curtiss, Sarah Stauffer <sarah.curtiss@stoel.com>
Subject: Wagon Trail Solar Project - Amendment Determination Request

Good morning, Chase and Sarah -

Wagon Trail Energy Center, LLC is submitting the attached Amendment Determination Request for the Wagon Trail Solar Project to add an area to the site boundary for temporary construction activities and modify the BESS technology.

We would appreciate an opportunity to talk about these proposed changes, please let us know your availability for a meeting in the next few weeks.

Thank you,
Carrie

Carrie Konkol | Vice President, Senior Project Manager, Pacific Offshore Energy Lead
Pronouns: she, her, hers
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Amendment Determination Request for the Wagon Trail Solar Project

Prepared for

Prepared by

November 2024

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Attachment 1. Long Duration Eos Energy Storage

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1.0 Introduction and Request

Wagon Trail Energy Center, LLC (Wagon Trail) is submitting this Amendment Determination Request (ADR) for the Wagon Trail Solar Project (Facility). As approved in the Application for Site Certificate (ASC; September 2024)[1], the Facility is a solar photovoltaic energy generation facility in Morrow County, Oregon, with an electrical capacity of up to 500 megawatts (MW). The Facility will consist of solar arrays and related or supporting facilities, including a battery energy storage system (BESS) located within an area encompassing approximately 7,450 acres of privately owned land. The anticipated construction start date for the Facility is Q1 2026.

To take advantage of BESS technological advances, Wagon Trail seeks to change the technology for a portion of the proposed BESS technology. The new BESS technology proposed is zinc bromide/electrolyte-based, which is fully recyclable with existing processes, does not require water use during operations, and does not require heating, ventilation, or air conditioning (HVAC) systems thereby reducing auxiliary loads by approximately 70 percent.

Therefore, Wagon Trail requests to modify the BESS technology:

- Change a portion of the proposed BESS technology from lithium-ion to zinc electrolyte-based, long duration Eos energy storage (up to approximately 15- MW worth; the rest of the BESS MW would remain lithium-ion[2]) (see Attachment 1 for a description of this technology).

The BESS will be contained within the approved BESS footprint and thus no additional environmental surveys are necessary. Overall, the proposed change is insubstantial because it does not propose any new or additional facilities, meets all Site Certificate conditions, and is needed to take advantage of BESS technological advances. Moreover, as outlined in Section 3, the proposed change does not trigger any of the three "coulds" under Oregon Administrative Rules (OAR) 345-027-0350(4), which elicit an amendment.

The proposed change in BESS technology will add no additional acreage to the Site Boundary and would occur within the approved BESS footprint. No new facilities or changes to the dimensions of the permitted facilities are being proposed. Therefore, the Wagon Trail is requesting a written determination under OAR 345-027-0357(1)(b) for concurrence that the proposed change to the BESS technology does not require a Site Certificate amendment.

The proposed change does not require an amendment because:

[1] Site Certificate for Wagon Trail Solar Project (September 30, 2024). https://www.oregon.gov/energy/facilities-safety/facilities/Facilities library/2024-09-26-WTSAPP-SIGNED-Site-Certificate.pdf

[2] A total of 15 MW of the new BESS technology is being supported by a U.S. Department of Energy grant; The technology is not yet commercially feasible with current lithium iron phosphate batteries in use. Additionally, more long-duration energy storage performance research is needed before the technology can be commercially marketable.

1. Wagon Trail will construct and operate the Facility substantially in the manner as previously disclosed;
2. Micrositing for constructability is inherent in finalizing the design to the Site Certificate;
3. The BESS modification will allow the certificate holder to take advantage of BESS technological advances; and
4. The proposed change does not create new impacts that were not previously considered by Energy Facility Siting Council (Council).

The proposed change is consistent with the intent of the Site Certificate to minimize impacts whenever feasible. Therefore, Wagon Trail is requesting a written determination under OAR 345-027-0357 for concurrence that the proposed change does not require a Site Certificate amendment because this change is inherent to the Site Certificate, as provided by the Site Certificate Conditions. Wagon Trail provides an amendment determination evaluation (Section 3) and demonstrates that the proposed change complies with the requirements of all applicable standards and all existing Site Certificate Conditions (Section 4), and could be included in and governed by the Site Certificate without an amendment.

2.0 Description of Proposed Change (OAR 345-027-0357(4)(a & b))

Wagon Trail seeks to change a portion of the proposed BESS technology from lithium-ion to zinc electrolyte-based, long duration Eos energy storage. The change in BESS technology will add no additional acreage to the Site Boundary and would occur within the approved BESS footprint.

Specifically, Wagon Trail is requesting to change the BESS technology for the following purposes:

- To take advantage of BESS technological advances, Wagon Trail seeks to change a portion of the proposed BESS technology from lithium-ion to zinc electrolyte-based, long duration Eos energy storage (up to 15 MW total). As stated previously, this BESS technology is non-flammable and does not require HVAC systems nor water use during operations, as compared to lithium-ion, making it a safer BESS option. This technology is also fully recyclable with existing processes, and requires less materials/more widely available materials to manufacture, making it more environmentally friendly and cost effective to produce. See Attachment 1 for further details and additional benefits of zinc electrolyte-based, long duration Eos energy storage.

No new facilities or changes to the dimensions of the permitted facilities are being proposed, and the BESS will remain within the approved BESS footprint.

3.0 Amendment Determination Evaluation (OAR 345-027-0357(4)(c))

Pursuant to OAR 345-027-0357(1)(b), the purpose of this ADR is to obtain the Oregon Department of Energy's (ODOE) determination that the proposed change in BESS technology does not require a Site Certificate amendment. OAR 345-027-0353 provides exemptions for changes not requiring an amendment. Only one of these exemptions applies to solar energy facilities and is related to an increase in electrical energy generating capacity. The proposed change does not affect the electrical energy generating capacity, therefore the proposed change is not exempt under OAR 345-027-0353. OAR 345-027-0350 identifies the types of changes that would require the Wagon Trail to amend its Site Certificate. This section demonstrates that the modification proposed in this ADR is not subject to a Site Certificate amendment based on the OAR 345-027-0350 factors.

> *(1) Transfer ownership of the facility or the certificate holder as described in OAR 345-027-0400;*

The proposed change does not affect the ownership of the facility or Wagon Trail as described in OAR 345-027-0400. Therefore, a Site Certificate amendment is not required based on this factor.

> *(2) Apply later-adopted law(s) as described in OAR 345-027-0390;*

The proposed change does not change the result of a later-adopted law, as described in OAR 345-027-0390. Therefore, a Site Certificate amendment is not required based on this factor.

> *(3) Extend the construction beginning or completion deadline as described in OAR 345-027-0385;*

The proposed change will not extend the previously approved construction's beginning or completion deadlines.[3] Therefore, a Site Certificate amendment is not required based on this factor.

> *(4) Design, construct or operate a facility in a manner different from the description in the site certificate, if the proposed change:*
>
> > *(a) Could result in a significant adverse impact that the Council has not addressed in an earlier order and the impact affects a resource or interest protected by a Council standard;*

No new facilities or changes to the dimensions of the permitted facilities are being proposed. The BESS will remain within the approved BESS footprint and will utilize the foundations and containers described in the Site Certificate.

Section 4 demonstrates that the proposed change will neither result in significant adverse impact that the Council has not addressed in the final order, nor an impact that affects a resource or interest protected by a Council standard. The analysis provided in Section 4 demonstrates that the

[3] Site Certificate for Wagon Trail Solar Project (September 20, 2024).

change to the BESS technology will not result in any adverse impacts to any resources protected by Council standards, as described under OAR 345-027-0050(4)(a).

> *(b) Could impair the certificate holder's ability to comply with a Site Certificate condition; or*

Section 4 describes how the proposed change will not impair the Wagon Trail's ability to comply with any Site Certificate condition especially since no Site Certificate conditions are implicated by the proposed change. Therefore, a Site Certificate amendment is not required based on this factor.

> *(c) Could require a new condition or a change to a condition in the site certificate.*

The proposed change will neither require a new condition, nor change a condition in the Site Certificate. As noted above, there is no condition in the Site Certificate specifically implicated by the proposed change because the Site Certificate conditions are reflective of micrositing flexibility in consideration of perpetual technological advances. Therefore, a Site Certificate amendment is not required based on this factor.

Wagon Trail concludes the proposed change does not meet any of the factors indicated above, and that a Site Certificate amendment is not required. Section 4 further demonstrates how the proposed change is consistent with Council's previous findings, applicable laws, and Council standards, and will not require changes to the Site Certificate. Therefore, this evaluation confirms that the proposed change could be included in and governed by the Site Certificate without an amendment to the Site Certificate.

4.0 Additional Information – Standards Evaluation (OAR 345-027-0357(4)(d))

The proposed change does not require a Site Certificate amendment. The change in BESS technology will not alter the Site Boundary and will occur within the already approved BESS footprint. No new facilities or changes to the dimensions of the permitted facilities is being proposed. Table 1 provides an evaluation of the proposed change's compliance with the Division 22 and Division 24 standards, and identifies the associated Site Certificate Conditions that the proposed change will comply with, as applicable, to support the conclusion that no Site Certificate amendment is required for the proposed change.

Table 1. Standards, Laws and Site Certificate Evaluation

Standard	Evaluation	Related Site Certificate Conditions
OAR 345-022-0000 General Standard of Review	The Council previously found that the Facility complies with the General Standard of Review. The proposed change does not affect this finding and the Facility can continue to comply with the related Site Certificate Conditions. new facilities or changes to the dimensions of the permitted facilities are being proposed. The Facility will continue to provide an overall public benefit that outweighs any adverse effects to a particular resource or interest protected by the applicable standards. The proposed change will not result in a significant impact not previously reviewed by the Council because the BESS will remain within the approved BESS footprint. With the proposed change, the Facility is still being designed and constructed, and will be operated and retired substantially as described in the Site Certificate; in compliance with ORS Chapter 469, applicable Council rules, and applicable state and local laws, rules and ordinances; and, in compliance with all applicable permit requirements of other state agencies (see also review of other standards). Therefore, based on the foregoing, and review and compliance with the applicable Site Certificate conditions, the proposed change makes no changes that would alter the basis for the Council's earlier findings that the OAR 345-022-0000 General Standard of Review is satisfied.	GEN-GS-01 Commencement of construction GEN-GS-02 Completion of construction GEN-GS-03 Compliance during all phases GEN-GS-04 Notification of environmental impacts GEN-GS-05 Transfer of ownership GEN-GS-06 Transmission line and BESS safety standards GEN-GS-07 Transmission approved corridor GEN-GS-08 Annual reporting PRE-GS-01 Construction rights PRE-GS-02 Compliance plan PRO-GS-01 Revegetation and removal of temporary structures
OAR 345-022-0010 Organizational Expertise	The Council has previously determined that Wagon Trail has adequate organizational expertise to construct, operate and retire a solar energy facility. Wagon Trail is wholly owned by Wagon Trail Energy Center, LLC, a subsidiary of NextEra Energy Resources, LLC, and its organizational expertise was described in the ASC. There have been no changes to Wagon Trail' organizational expertise that would impact prior findings. Wagon Trail has the organizational expertise to implement the proposed modification, without compromising the Council's ongoing conclusions under this standard. Therefore, based on the foregoing, and review and compliance with the applicable Site Certificate conditions, the proposed change makes no changes that would alter the basis for the Council's earlier findings that the OAR 345-022-0010 Organizational Expertise Standard is satisfied.	GEN-OE-01 Responsibility of non-compliance GEN-OE-02 Report of Site Certificate violations GEN-OE-03 Compliance with laws for battery disposal & transport PRE-OE-01 Notification of contractor and manager identities PRE-OE-02 Proof of federal, state, and local permits CON-OE-01 Semiannual reporting PRO-OE-01 Operation manager qualifications OPR-OE-01 Operation manager contact information OPR-OE-02 Equipment malfunction and repair records
OAR 345-022-0020 Structural Standard	Wagon Trail will comply with pre-construction Site Certificate conditions related to the Structural Standard including those related to geological hazards. Wagon Trail will use experts in the fields of engineering and geology to complete site-specific geotechnical investigations prior to construction to verify that soil conditions are suitable at Facility locations, as necessary. Additionally, the conditions listed in the Structural Standard section of the Site Certificate provide further assurance that the proposed modifications will not affect Wagon Trail coordination with the Oregon Department of Geology and Mineral Industries, or the requirements of Oregon's Building Code Division. Wagon Trail' ability to design, engineer, and construct the Facility to avoid dangers to human safety is not affected by the proposed change. No new facilities or changes to the dimensions of the permitted facilities are being proposed and the BESS will remain within the approved BESS footprint. Therefore, based on the foregoing, and review and compliance with the applicable Site Certificate conditions, the proposed change makes no changes that would alter the basis for the Council's earlier findings that the OAR 345-022-0020 Structural Standard is satisfied.	GEN-SS-01 Avoidance of seismic hazards GEN-SS-02 Compliance with building codes GEN-SS-03 Notification of geologic hazards PRE-SS-01 Geological investigation reporting
OAR 345-022-0022 Soil Protection	Wagon Trail will comply with all Site Certificate conditions related to the Soil Protection Standard. These conditions require Wagon Trail to construct the Facility in compliance with an Erosion and Sediment Control Plan satisfactory to the Oregon Department of Environmental Quality, as per the requirements of a National Pollutant Discharge Elimination System (NPDES) permit. This includes measures to salvage topsoil from areas temporarily impacted and stockpile this topsoil for redistribution, as well as manage concrete wastewater runoff to protect soil and water resources. The BESS will remain within the approved BESS footprint. The proposed change does not impair Wagon Trail' ability to implement erosion control measures required by the Facility's NPDES permit. No new facilities or changes to the dimensions of the permitted facilities are being proposed and the BESS will remain within the approved BESS footprint. The proposed modification does not change any of the conclusions under the Soil Protection Standard, which the Council has already approved under the Site Certificate. Therefore, the proposed change does not change the Council's earlier findings regarding the Soil Protection standard and compliance with the existing conditions demonstrates that the modification can be included in and governed by the Site Certificate without an amendment. Thus. the OAR 345-022-0022 Soil Protection Standard is satisfied.	PRE-SP-01 National Pollutant Discharge Elimination System (NPDES) General Permit 1200-C and Erosion Sediment Control Plan (ESCP) PRE-SP-02 Spill Prevention, Control, and Countermeasure (SPCC) construction plans CON-SP-01 Compliance with NPDES 1200-C and ESCP CON-SP-02 Compliance with Construction SPCC plan PRO-SP-01 Submission of operational Spill Prevention, Control, and Countermeasure OPR-SP-01 Prevention of erosion, soil disturbance OPR-SP-02 Solar panel washing guidelines OPR-SP-03 Compliance with Operations SPCC plan

Standard	Evaluation	Related Site Certificate Conditions
OAR 345-022-0030 Land Use	There have been no modifications to the Morrow County Zoning Ordinance (MCZO; updated in 2024) since submittal of the ASC in 2024 that would apply to the proposed modification. Similarly, the proposed change will not affect the Council's previous conclusions regarding the Land Use Goals of the Morrow County Comprehensive Plan (updated in 2018). The Facility will continue to comply with the general criteria of the MCZO. Portions of MCZO Articles 1, 3, 4, and 6 apply to the Facility and require that there be no significant interference with accepted farming practices on adjacent lands devoted to farm use. The proposed modification of the BESS will occur within the approved BESS footprint. Wagon Trail will continue to follow all Land Use Conditions, including those requiring infrastructure/yard setbacks (GEN-LU-01 and PRE-LU-03) and adherence to MCZO development standards (PRE-LU-04). Consultation with landowners according to Site Certificate Conditions PRE-LU-06 and CON-LU-02 are also intended to satisfy the conditions of MCZO and minimize impacts to farmlands/Exclusive Farm Use. Additionally, Wagon Trail remains committed to providing funding according to Site Certificate Conditions PRE-LU-08 and PRE-LU-09 and will construct the transmission line according to PRE-LU-02. Therefore, the proposed change complies with the Land Use Standard, the MCZO, and the Morrow County Comprehensive Plan. The proposed change would not result in any land use impacts that have not been addressed by the Council. No new facilities or changes to the dimensions of the permitted facilities are being proposed and the BESS will remain within the approved BESS footprint. Therefore, the proposed change makes no changes that would alter the basis for the Council's earlier findings under OAR 345-022-0030 that the Land Use Standard is satisfied.	GEN-LU-01 Final design and setbacks PRE-LU-01 Zoning permits and conditional use permit PRE-LU-02 Transmission line siting in right-of-way PRE-LU-03 Final design and setbacks PRE-LU-04 Final site plan PRE-LU-05 Noxious Weed Plan PRE-LU-06 Landowner consultation and farming impacts PRE-LU-07 Covenant Not to Sue PRE-LU-08 Oregon State Agricultural Research Program PRE-LU-09 Morrow County Grain Growers CON-LU-01 Implementation of Noxious Weed Plan CON-LU-02 Minimization of farming impacts PRO-LU-01 Interconnection agreement OPR-LU-01 Implementation of Noxious Weed Plan OPR-LU-02 Minimization of farming impacts
OAR 345-022-0040 Protected Areas	The proposed change is within the existing analysis area for Protected Areas Standard. No new facilities or changes to the dimensions of the permitted facilities are being proposed and the BESS will remain within the approved BESS footprint. Therefore, the proposed change makes no changes that would alter the basis for the Council's earlier findings that under OAR 345-022-0040 the Protected Areas Standard is satisfied.	N/A
OAR 345-022-0050 Retirement and Financial Assurance	The proposed change will not alter the Wagon Trail's ability to restore the site to a useful, nonhazardous condition following permanent cessation of construction or operation of the facilities. A retirement cost estimate was provided for the Facility being constructed as part of the ASC submittal. Wagon Trail will rely on Condition PRE-RF-01 to post a bond during preconstruction compliance in an amount based on the final design, which would reflect the proposed change, as applicable. Therefore, the proposed change does not change the cost of restoring the site to non-hazardous condition. The proposed change would not alter the basis for the Council's earlier findings that the OAR 345-022-0050 Retirement and Financial Assurance Standard is satisfied.	GEN-RF-01 Prevention of non-restorable site GEN-RF-02 Shared use agreement for Operations and Maintenance Building PRE-RF-01 Bond or letter of credit to restore site to non-hazardous condition RET-RF-01 Compliance with retirement plan RET-RF-02 Retirement of Facility upon cessation of activities
OAR 345-022-0060 Fish and Wildlife Habitat	To verify absence of fish and wildlife species and habitat present in the Site Boundary, Wagon Trail completed habitat surveys, as provided in Exhibit P of the ASC. The status of all state sensitive, threatened, endangered, and proposed wildlife and vascular species that have the potential to occur at the Facility remain the same as reported in the surveys. No burrowing owl burrows, raptor nests, or other bird nests were encountered during the 2020 habitat survey. The proposed change makes no modification to the site boundary and thus no additional surveys are required. The proposed change will be covered under the Habitat Mitigation Plan, Reclamation and Revegetation Plan and Wildlife Monitoring and Mitigation Plan, without requiring any changes to those approved plans. The Facility remains appropriately sited in agricultural fields with low potential for wildlife habitat, and in a manner consistent with the Guidelines. Because there will be no change to the Site Boundary, there is no change the Council's previous conclusion that the Facility complies with the Fish and Wildlife Standard. Therefore, based on the foregoing, and review and compliance with the applicable Site Certificate conditions, the proposed change makes no changes that would alter the basis for the Council's earlier findings that the OAR 345-022-0060 Fish and Wildlife Standard is satisfied.	PRE-FW-01 Reclamation and Revegetation Plan PRE-FW-02 Habitat Mitigation Plan PRE-FW-03 Sensitive species' nest avoidance CON-FW-01 Implementation of Reclamation and Revegetation Plan CON-FW-02 Raptor nest buffers CON-FW-03 Worker environmental training program CON-FW-04 Speed limits OPR-FW-01 Implementation of Reclamation and Revegetation Plan OPR-FW-02 Implementation of Habitat Mitigation Plan OPR-FW-03 Implementation of Wildlife Monitoring and Mitigation Plan

Standard	Evaluation	Related Site Certificate Conditions
OAR 345-022-0070 Threatened and Endangered Species	To verify absence of fish and wildlife species and habitat present in the Site Boundary, Wagon Trail completed habitat surveys, as provided in Exhibit P of the ASC. The status of all state sensitive, threatened, endangered, and proposed wildlife and vascular species that have the potential to occur at the Facility remain the same as reported in the surveys. No burrowing owl burrows, raptor nests, or other bird nests were encountered during the 2020 habitat survey. The proposed change makes no modification to the site boundary and thus no additional surveys are required. The proposed change will be covered under the Habitat Mitigation Plan, Reclamation and Revegetation Plan and Wildlife Monitoring and Mitigation Plan, without requiring any changes to those approved plans. As noted in the previous section, the Facility remains appropriately sited in agricultural fields with low potential for wildlife habitat, and in a manner consistent with the Guidelines. Because there will be no change to the Site Boundary, there is no change the Council's previous conclusion that the Facility complies with the Threatened and Endangered Species Standard. Therefore, based on the foregoing, and review and compliance with the applicable Site Certificate conditions, the proposed change makes no changes that would alter the basis for the Council's earlier findings that the OAR 345-022-0070 Threatened and Endangered Species Standard is satisfied.	GEN-TE-01 Laurence milkvetch avoidance PRE-TE-01 Determination of Washington ground squirrel (WAGS) boundaries PRE-TE-02 Determination of Laurence milkvetch boundaries CON-TE-01 Flagging of WAGS boundaries
OAR 345-022-0080 Scenic Resources	The proposed change is within the existing analysis area for the Scenic Resources Standard. No new facilities or changes to the dimensions of the permitted facilities are being proposed and the BESS will remain within the approved BESS footprint. Therefore, the proposed change makes no changes that would alter the basis for the Council's earlier findings that the OAR 345-022-0080 Scenic Resources Standard is satisfied.	N/A
OAR 345-022-0090 Historic, Cultural and Archaeological Resources	To verify the presence of historic, cultural, or archaeological resources in the Site Boundary, Wagon Trail completed cultural surveys, as submitted in Exhibit S of the ASC. No historic, cultural or archaeological resources were identified. The proposed change makes no modification to the site boundary and thus no additional surveys are required. Consistent with the Site Certificate Conditions, any cultural resources that are identified during the life of the Facility will be treated according to the Inadvertent Discovery Plan. Therefore, the proposed change makes no changes that would alter the basis for the Council's earlier findings that the OAR 345-022-0090 Historic, Cultural and Archaeological Resources is satisfied.	PRE-HC-01 Historic and Archaeological Resources Mitigation and Monitoring Plan PRE-HC-02 Inadvertent Discovery Plan CON-HC-01 Implementation of Inadvertent Discovery Plan OPR-HC-01 Implementation of Inadvertent Discovery Plan
OAR 345-022-0100 Recreation	The proposed change is within the existing analysis area for the Recreation standard. The proposed change will not be any closer or make any change that would alter the basis for the Council's earlier findings that the OAR 345-022-0100 Recreation Standard is satisfied.	N/A
OAR 345-022-0110 Public Services	The proposed change is within the existing analysis area for Public Services. The modification will not alter the Facility's impacts on the ability of public and private service providers to supply sewer and sewage treatment, water, stormwater drainage, solid waste management, housing, traffic safety, police and fire protection, health care, and schools. The proposed change does not increase the number of solar arrays or other Wagon Trail facilities, and will reduce impact, improve safety, or are necessary to comply with a Site Certificate condition that are outside of the existing Site Boundary. Therefore, the proposed modification makes no changes that alter the basis for the Council's earlier findings and does not change the Facility's compliance with OAR 345-022-0110.	PRE-PS-01 Traffic Management Plan and Road Use Agreement PRE-PS-02 Federal Aviation Administration and Oregon Department of Aviation determinations CON-PS-01 Implementation of Traffic Management Plan and Road Use Agreement
OAR 345-022-0115 Wildfire Prevention and Risk Mitigation	The proposed change will not increase the wildfire risk generated by the Facility. Therefore, the proposed change makes no changes that would alter the basis for the Council's earlier findings that the OAR 345-022-0115 Wildfire Prevention and Risk Mitigation Standard is satisfied.	PRE-WF-01 Construction Wildfire Mitigation Plan CON-WF-01 Implementation of Construction Wildfire Mitigation Plan PRO-WF-01 Operations Wildfire Mitigation Plan OPR-WF-01 Implement of Operations Wildfire Mitigation Plan
OAR 345-022-0120 Waste Minimization	The proposed change will not increase the amount of solid waste and wastewater generated by the Facility. Therefore, the proposed change makes no changes that would alter the basis for the Council's earlier findings that the OAR 345-022-0120 Waste Minimization Standard is satisfied.	PRO-WM-01 Operational Waste Management Plan
OAR 345-024-0090 Transmission Lines	There will be no change to the approved transmission line.	PRO-TL-01 Management of human exposure to electromagnetic fields
OAR 340-035-0035 Noise	There will be no changes to the physical components of the Facility that would change the noise impact already assessed for the Facility.	PRE-NC-01 Noise analysis and waivers
Removal-Fill Law	The proposed change doesn't change that a removal-fill permit is not needed for the Facility because the Facility will not temporarily or permanently impact waters of the state.	N/A
Water Rights	The proposed change does not change the water volumes and sources as previously approved by Council for use during construction and operation of the Facility.	PRE-WR-01 Water amounts and sources CON-WR-01 Water sources

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5.0 Conclusion

The Wagon Trail provides this ADR to demonstrate that the proposed change does not fall under a factor requiring amendment under OAR 345-027-0350. Furthermore, as established by the findings and conclusions discussed in this ADR, the Facility, including the proposed change:

1. Complies with the requirements of the Oregon energy facility siting statutes, Oregon Revised Statutes (ORS) 469.300 to ORS 469.570, and ORS 469.590 to ORS 469.619;
2. Complies with the applicable standards adopted by the Council pursuant to ORS 469.501; and;
3. Complies with all other Oregon statutes and administrative rules applicable to the amendment of the Site Certificate that are within the Council's jurisdiction.

Therefore, ODOE may provide a written determination that no amendment of the Site Certificate is required for the proposed change.

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Attachment 1. Long Duration Eos Energy Storage

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Eos Energy Storage

Company & Product Overview

September 2022

Eos. Positively ingenious.

eos

Clean Energy Storage That Defies Convention

From our patented battery chemistry to our commonsense manufacturing process, Eos operating benefits deliver a significant reduction in levelized cost of storage.

Safe | **Scalable** | **Sustainable**

- Founded in 2008, 250+ team members
- Technology optimized for 4+ hour storage
- Zinc electrolyte-based chemistry;
  No rare earth minerals required
- Fully recyclable and non-flammable
- Designed and manufactured in America
- 94 patents pending, issued, or published in 24 countries
- Scaling to Gigawatt-hour annual production capacity

Leadership Team with 200+ Years of Energy Experience

Joe Mastrangelo
Chief Executive Officer

- >25 years at GE with 12+ years' CEO experience leading GE's energy businesses (Gas Power Systems, Power Conversion)
- Served as VP of Turbomachinery at GE Oil & Gas

Carlos Restrepo
Chief Technology Officer

- 20+ years of leadership experience in engineering and technology development in the energy industry.
- Board Director of the Smart Electric Power Alliance (SEPA)

Randall Gonzales
Chief Financial Officer

- 20+ years of experience in financial management and corporate strategy.
- Held senior-level positions in Lyndall, Caterpillar, and Nissan Motor as a CFO

William Mao
Chief Commercial Officer

- 30+ years of leadership experience in the Energy industry with companies like WEC, Eaton, ABB , Hitachi Energy
- Led multiple divisions in different market spaces

Steven Warthman
Chief Supply Chain Officer

- 30-year background at global companies, (automotive, aerospace & custom industrial manufacturing)
- Responsible for the development and manufacturing of the NASA EVA Spacesuit.

Melisa Berube
General Counsel

- Experience managing legal risk, corporate governance
- Served as General Counsel at Erickson Incorporated, and an associate at Schwabe, Williamson & Wyatt

David Leligdon
SVP, Projects

- 20+ years with Black & Veatch
- Held senior-level positions and lead successful development and deployment of large-scale commercial projects around the world

Francis Richey
VP, R&D

- Post-doctoral battery research at Stanford University
- Served as an R&D consultant for Physical Optics Corporation

Roma Desai
Chief People Officer

- 20+ years of experience – 15+ years in Man Energy solution
- Held VP Level positions and led regional and global roles as CFO and HR VP

BOARD MEMBERS

Russ Stidolph
Chairman

Co-Founder of Viridity Energy, Tres Amigas, AltEnergy, Hawkeye Renewables; Prior Principal at J.H. Whitney & Co.

Daniel Shribman

CEO, CFO, and Director BMRG
Served as CIO for B. Riley Financial and President of B. Riley Principal Investments

Claude Demby

President of Cree LED, a SMART Global Holdings, Inc. lighting innovation company

Alex Dimitrief

C-suite leader, former general counsel who has steered global energy businesses

Mimi Walters

CCO for Leading Edge Power Solutions, LLC. Former Member of the U.S. House of Representatives from California's 45th District

Audrey Zibelman

Vice President, X's moonshot for the electric grid to develop a single, virtualized view of the entire electricity system

Operating Highlights

Opportunity Pipeline[1]
$7.0 billion
representing 27 GWh

Booked Orders[2]
$324.7 million
representing 1.3 GWh

Orders Backlog[1]
$457.3 million
representing 1.9 GWh

Discharge Energy[3]
541 MWh
with 2.5+ million operating cycles

Revenue[4]
$5.9 million
with 91% total battery yield &
536 MWh annualized capacity[5]

Cash On Hand[1]
$16.3 million
closed $85 million senior secured term loan

(1) Numbers shown as of 6/30/2022
(2) For the six months ended 6/30/2022
(3) Numbers shown as of 7/29/2022
(4) For the three months ended 6/30/2022
(5) Annualized capacity estimated as of 6/30/2022

Eos Technology / Value Proposition

Eos Product Embodies Circular Economy

Raw Materials

- 5 widely available commodity materials: zinc, bromide, titanium, graphite felt, plastic
- No conflict minerals
- Extensive reserves of Zinc

Manufacturing

- No clean room -> 25x less energy per m^2
- 71% lower water footprint vs. Li-ion
- Battery-to-battery test charging: 75% energy reduction

Operations

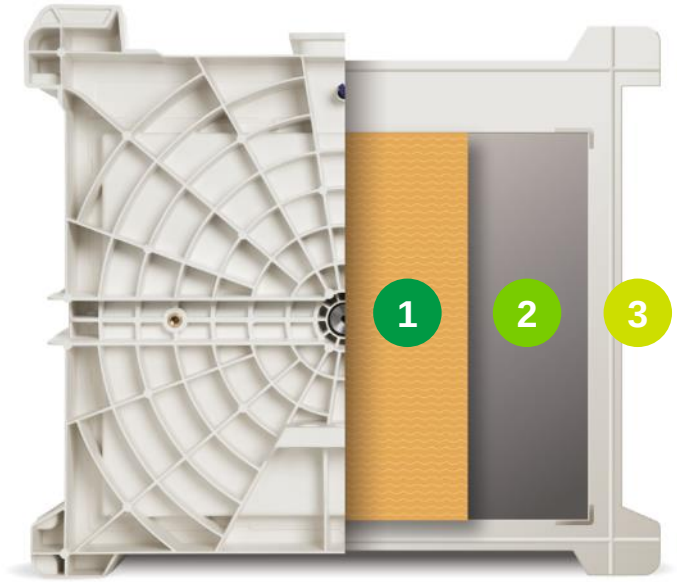
- No fire suppression
- No water use during lifetime
- No HVAC -> 70% lower aux load

End of Life

- Fully recyclable w/ existing process
- Life extension and reuse plan
- Can easily repurpose sites after decommissioning

Widely-available + Locally-Sourced Materials

1. **Zinc-bromide**
   High-performance aqueous electrolyte
2. **Titanium and graphite felt**
   Non-degradable bipolar electrodes
3. **Plastic**
   Fully-sealed polymer frames



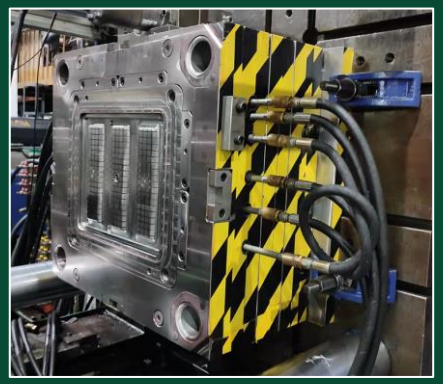
Widely-available

	Zinc-bromide Zn/Br2 *In Use Since 2013*	**Titanium** *In Use Since 2011*	**Graphite felt** *In Use Since 2015*	**Plastic** *In Use Since 2019*
Type	Battery grade Purified zinc bromide solution	Grade 2 commercially pure Non-aerospace industrial grade	Graphitized polyacrylonitrile Carbon fiber precursor	HDPE High Density polyethylene
Top consumers	• Flame retardants • Mining • Fracking	• Infrastructure • Architectural • Medical • Aerospace	• Automotive • Aerospace	• Automotive • Electronics • Construction
Est. annual global capacity	13.2M MT/ 350K MT	277K MT	32.55K MT	61M MT
% of global demand @ 1GW	**0.08% / 7.61%**	**2.56%**	**4.50%**	**0.03%**

Developing a smaller, more powerful battery (Z3)

Moving to manufacturing at scale

Module Lid



Module Box

Electrode

Z3 Module

- ✓ Completed FEA modeling for module mechanical design
- ✓ Electrode insertion force testing underway and fixtures for electrode insertion designed
- ✓ Optimized processing parameters for electrode assembly
- ✓ Began 50ºC elevated temperature testing

Developing a smaller, more powerful battery (Z3)

Same chemistry with a simpler mechanical design

ILLUSTRATIVE

1 battery = 20 cells

1 enclosure = 576 batteries

5 enclosures = ~9 x 42 ft

Equivalent site space of a 40’ container

Eos Technology Delivers Competitive Advantages

Improved performance with expected resulting in ~16% reduction in levelized cost of storage vs other chemistries

Depth of Discharge

Eos: Designed for 100% utilization, no additional upsizing required

Li-ion: DoD restrictions requires more batteries to deliver the same kWh

Efficiency & Capex Savings

Flattening Degradation Curve

Eos: flat degr. After ~10% in the first 3 years operation; 20+ year life

Li-ion: 2.5% / year loss of energy; 12-year life

Product Life

Flexible Charge / Discharge Duration

Eos: Can charge and discharge at different rates depending on changing use cases

Li-ion: Charge and Discharge rates are fixed at the start, and can degrade life if not used as rated

↑ Revenue

↓ Risk

Wide Operating Temperature Range

Eos: Flat performance curve from –20 to 50ºC; no need for HVAC

Li-ion: Restricted to 25ºC ± 5ºC; requires HVAC and fire suppression

Capex Savings

Low Maintenance

Eos: Simple fans, no fire suppression, recovers from 90ºC+ abuse cycles

Li-ion: HVAC and fire suppression, requires maintenance + CapEx

Opex Savings

Minimal Auxiliary Load

Eos: Fans represent ~1-2% of delivered energy

Li-ion: HVAC represents ~8-12% of delivered energy

Aux Load Savings

Ride Through Grid Outages

Eos: Continues charging even when AC grid is down

Li-ion: Cannot operate without grid power (due to aux. load)

↑ Availability

No Supply Chain Constraints

Eos: Widely available commodities and off-the-shelf components

Li-ion: Limited supply of Lithium and Cobalt, competing demand from portables and EVs

Shortened lead time

Fully Recyclable

Eos: All components are recyclable, salvage value at EoL

Li-ion: non-recyclable components, minimal disposable cost

NPV Savings

Eos. Positively ingenious.

Lower levelized cost of storage vs. competition

Advantages position Eos to outpace Li-ion … Eos position vs LCOS main impacting factors

FACTOR	VARIABLE	EOS VALUE PROPOSITION	EOS POSITIONING
Capital Costs	• *Product Costs* • *System Size*	• 5 earth abundant raw materials • Flexible configurations • Low-cost manufacturing	Competitive Capex
Operating Costs	• *Maintenance Costs* • *Parasitic losses*	• Non-Flammable • Low Auxiliary load • Minimal maintenance costs	Lower Opex
Product Life	• *Performance Degradation* • *Useful life*	• 20-year useful life • Low year-over-year degradation • Minimal system augmentation	Significantly Lower Aux Load
System Efficiency	• *Operability* • *Round Trip Efficiency*	• Full depth of discharge • Flexible operations • Lower RTE	Higher Charging Cost

Fully recyclable at the end of useful life

Eos. Positively ingenious.

UL Tested - Positive Performance under strenuous UL testing

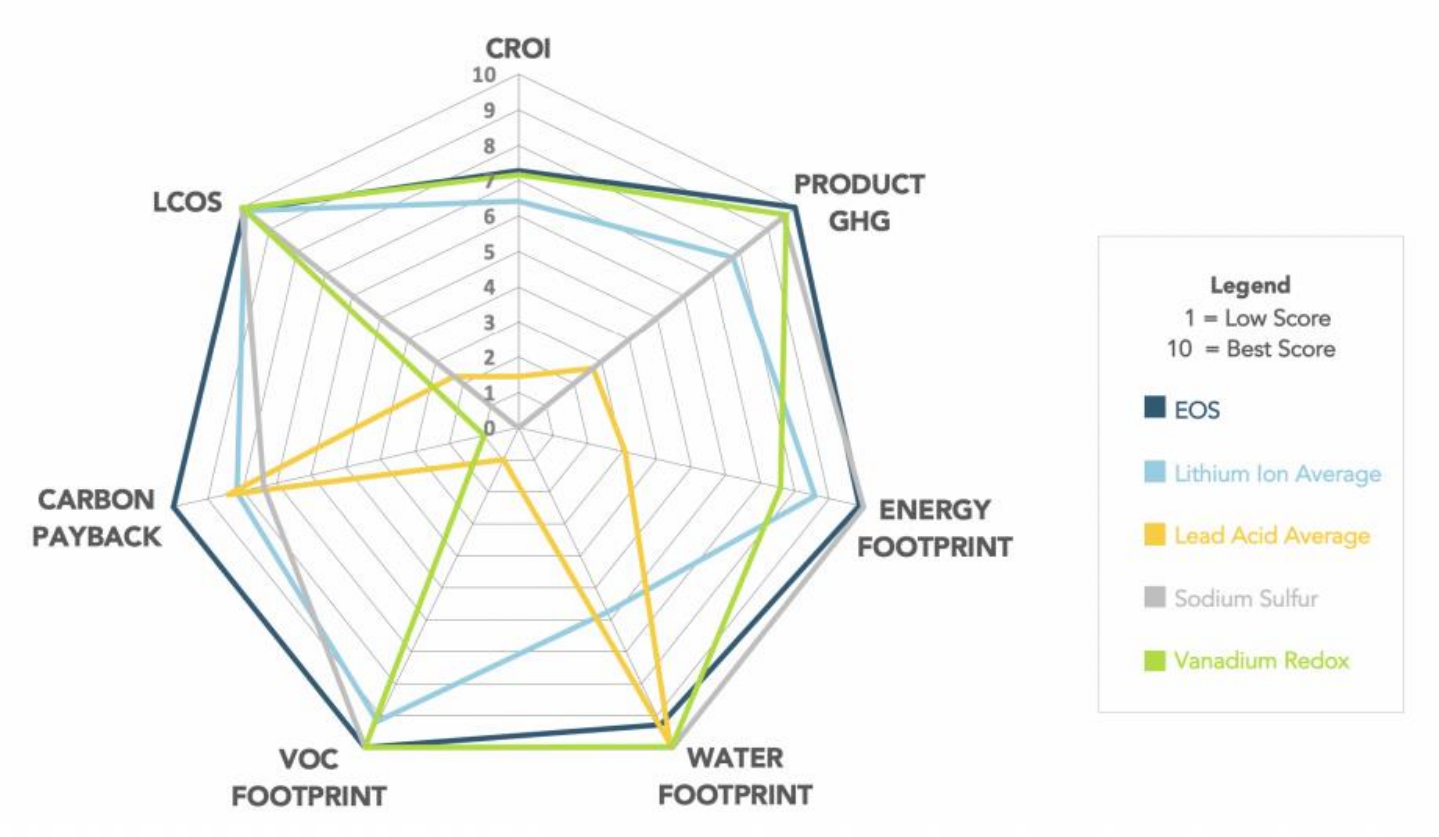
- UL 1973: “Standard for Safety, for Stationary Applications”
- UL 9540A: “Standard for Safety for Thermal Runaway”, represents harshest abuse testing

Test Type/Description	Eos Performance
Over Discharge: Discharge to zero voltage	✓ None ✓ Ready for continued operation
2½” Nail Penetration: Inject nail through battery case, causing cell short	✓ 25°C temperature rise
Indefinite Overcharge: Charge battery indefinitely	✓ Battery reaches 90°C, No Flame, no explosion; electrolyte/steam release at terminals and gas channel
Battery Short Circuit: Connect + & – terminals together while battery is fully charged resulting in 40x nominal current (20x maximum current for battery module)	✓ Battery reaches 80°C and 425 amps of peak current, No Flame, no explosion; steam release at terminals and gas channel

Boundless report validates Eos sustainability

BOUNDLESS
IMPACT RESEARCH & ANALYTICS

Benchmarking and Conclusions



- Safe and abundant materials – lower impact, lower risk
- 84% lower GHG footprint than Li-ion batteries
- Carbon payback time 2.4x lower than Li-ion
- Eos battery requires 71% less water per kWh for material extraction & production compared to Li-ion

Deploying Energy Storage

Eos. Positively ingenious.

eos

Powering our nation with positively ingenious clean energy storage.

Eos system's superior operational flexibility is optimized for 3- to 12-hour discharge to better match variable supply with dynamic demand.

American made

Designed in Edison, NJ, birthplace of the light bulb. Built in a revitalized plant in Mon Valley, PA.

Eos is tapping into our nation's diverse and skilled workforce, contributing to the development of a "green collar" generation in America's proud innovation and manufacturing legacy.

Diverse workforce

400+

people

Certified safe

Proven to fit safely and soundly into the places we live, work, and play.

Eos Z3™ battery technology's water-based electrolyte and flame-retardant housing make it inherently safe, with no risk of corrosion or thermal runaway.

Certified to

UL1973

Batteries in Stationary Applications standard

Locally sourced

A supply chain supported by a network red, white, and blue American businesses

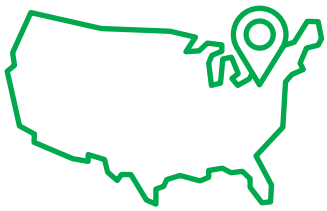
Eos Z3™ zinc-powered technology relies on five low-cost, widely-used, ethically-extracted commodities, majority sourced from American suppliers located within a day's drive of our Turtle Creek , PA manufacturing facilities.

Made of over

90%

domestic content*

Aids in qualifying for tax credits under the Inflation Reduction Act.



Functionally silent

Able to noiselessly power a dense Detroit neighborhood or a secluded San Diego suburb.

Eos systems are as quiet as an everyday conversation, thanks to our exterior venting design that ensures sufficient airflow to dissipate waste heat—compared to HVAC systems used by other technologies, that are as loud as wailing police siren.

Operates at approximately

50-65

decibels

Military-grade secure

Shielded against unwelcome supply chain disruptions and harmful cyber intrusions.

Eos technology is free from any foreign components or software, rendering it not only safe and secure for sensitive military use, but fast and easy to scale to meet our nation's growing demand.

NDAA COMPLIANT

Climate proof

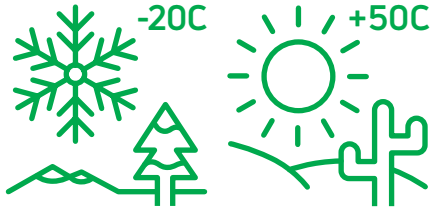
Ready for the bone-chilling cold of a Maine winter or the blazing heat of a Texas summer.

Eos systems are fortified with proprietary chemistry that can effortlessly adapt to the diverse operational demands and fluctuating temperature ranges communities are experiencing nationwide—without compromising their lifespan.

Expected lifespan of

20+

years



*Based on independent review by Baker Tilly US.

Since our founding in 2008, Eos has been on a mission to accelerate the shift to clean energy with positively ingenious zinc-powered battery storage solutions.

Our latest generation Eos Z3™ module forms the core of our Eos Cube systems. Its innovative design extracts the highest performance yet from our breakthrough Eos Znyth™ aqueous zinc chemistry, overcoming the limitations of conventional lithium-ion technology.

Today we're proud to provide not just utilities, but commercial, industrial, municipal, and military customers with the market's only high-performing, price-competitive, commercially-proven—and US-made—alternative for 3- to 12-hour, intraday energy storage applications.

Eos positively ingenious solutions are designed and manufactured in the USA.

Eos Energy Enterprises, Inc.
3920 Park Avenue / Edison, NJ 08820
1 732 225 8400 / info@eose.com / eose.com

Eos Z3

Zinc-powered aqueous liquid battery module

It's the intraday market's only U.S.-designed and -manufactured—and fully-commercialized—alternative to lithium ion and lead acid monopolar batteries for critical 3- to 12-hour discharge duration applications.

Our latest generation Eos Z3 battery module sets new standards in simplicity, safety, durability, flexibility, and availability. Its ingenious design extracts the highest performance yet from our proven zinc hybrid cathode technology, solving the limitations that other stationery energy storage solutions ignore—and transforming how utility, industrial, and commercial customers store power.

Technology	Zinc hybrid cathode
Module version	Z3
Voltage range	22 to 48 VDC
Rated Power (DC) / Energy	Up to 0.20 kW / 1.2 kWh
Certifications	UL 1973, UL9540A
Dimensions	7.3H x 14.7W x 12.4D in 18.5H x 37.3W x 31.5D cm
Weight	45 lbs / 20.5 kg

Three proprietary components. One ingenious design.

With more than 122 patents pending, published, or issued, our streamlined zinc-powered Eos Z3 battery module design features an aqueous electrolyte, bipolar electrodes, and a polymer casing.

1

Non-degradable bipolar electrodes

Conductive plastic anodes (-)and carbon-felt cathodes (+) make up the Z3 electrodes. They're mechanically tough, corrosion resistant, and chemically stable, delivering for years with virtually no degradation. Plus, our bipolar structure simplifies internal battery connections to reduce internal resistance and improve round-trip efficiency.

2

High-performance aqueous electrolyte

Our innovative blend of water, halides, additives, and buffering agents make up our proprietary aqueous electrolyte. The formula both enhances zinc solubility and plating and eliminates the dendrite and densification issues that can lead to performance decay and safety hazards.

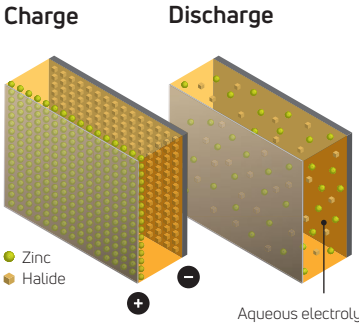
3

Fully-sealed polymer casing

A rugged, injection-molded thermoplastic polymer exterior provides an optimized structure into which our electrodes are inserted—the Z3 design requires just 20 of them—minimizing materials, manufacturing, and maintenance. And all while eliminating the risk of any external leaking.

Inspired by zinc plating baths

Z3 battery modules store electrical energy through zinc deposition. Our aqueous electrolyte is held within the individual cells, creating a pool that provides dynamic separation of the electrodes. During charge and discharge, ions move through the electrolyte to their respective electrode to donate or accept electrons, creating a current flow through the bipolar stack..



Realizing the full power of zinc

Eos Z3 modules are as high-performing and price-competitive as leading industry storage solutions in the intraday market. But our proven, zinc-powered chemistry delivers significant additional operational advantages in 3- to 12-hour discharge duration applications that other technologies can't.

Simple
Fully sealed.
Long lived.

Each Z3 battery module is a self-contained unit, a closed-system design with no moving or delicate parts, so they're as easy and cost-effective to maintain as they are to manufacture. And they can last at least 20 years — almost twice the operational life of most conventional battery chemistries.

Safe
Non-flammable.
Non-corrosive.

Z3 modules are inherently safe to use. With a water-based electrolyte and flame-retardant polymer framing, there's no risk of thermal runaway. When fully charged, they're at most mildly acidic (pH 2-4 range). And even when over-charged, only negligible levels of hydrogen are off-gassed.

Durable
High tolerance.
Low degradation.

No matter what conditions our Z3 battery modules face, they keep on going—even fully recovering from 90°C+ abuse cycles with just a simple, short rest period—with no change to their overall degradation curve. Which, at less than 3% over 20 years, is well below any conventional standards and do not require augmentation.

Lasts
20 years

Certified to the
UL1973
Batteries in Stationary Applications standard

Retains
>97%
of rated system capacity

Flexible
Variable DoD.
Variable duration.

Our zinc-based battery chemistry is highly tolerant of significant variation in operational requirements. A Z3 module's storage duration can range from 3 to 12 hours, with no impact on degradation. And the maximum DoD can be reduced for applications demanding round trip efficiency in the mid-80s.

Maximum of
100%
Depth of Discharge (DoD)

Available
Reliable supply.
Ethical sourcing.

Z3 modules require just five low-cost, widely-used, earth-abundant commodities, that have no geopolitical issues connected to their extraction. This enables local sourcing that minimizes the risk of supply chain disruptions—and related price swings.

Approximately
80%
of materials sourced within a day's drive

Power that stacks up.

Z3 battery modules are the building blocks of all of our ingenious energy storage systems. Our standard Z3 strings are racked in a variety of configurations to form our Eos Cube, Eos Hangar, and Eos Stack solutions.

Eos. Positively ingenious.

Eos Energy Enterprises, Inc.
3920 Park Avenue / Edison, NJ 08820
1 732 225 8400 / info@eose.com / eose.com

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Attachment 3: Certificate Holder Responses to Department Preliminary Review of ADR

Oregon Department of Energy – Preliminary Review of Amendment Determination Request for Wagon Trail Solar Project
November 19, 2024

Rule/Topic	Request for Additional Information	Comments/Notes	Certificate Holder Response
OAR 345-021-0010(1)(b)(ii) (description of proposed change)	Provide a markup of the existing BESS description, as presented in the Site Certificate (and provided in "Comments/Notes" column of this table), to account for zinc electrolyte-based, long duration Eos energy storage.	The Site Certificate Table 1 and pp. 8-9 describes the BESS, including the following: Battery Energy Storage System (Lithium-ion) Approx. total batteries 604 each Site size (northern; southern) 10; 25 acres Approx. total containers 604 each Approx. container dimensions 8 x 9.5 x 20 H x W x L, feet Noise level (broadband) 100 dBA Modules are placed in anchored racks within the concrete containers; typically, each rack houses 8 to 15 battery modules along with a switchgear assembly depending on the configuration chosen. Cooling units will be placed either on top of the concrete containers or along the side. There are two approved locations for the battery storage units, one of the AC coupled battery storage sites would consist of up to 182 battery storage units located adjacent to the northern substation, occupying approximately 10 acres. The second of the two AC coupled battery storage sites would consist of up to 422 battery storage units and would be collocated with the southern substation, occupying approximately 25 acres. Both sites will be fenced separately from the solar array. The battery storage systems as a whole may use a series of self-contained containers located within a fenced area or would be located within a single warehouse-type enclosure of a similar scale and size. Each battery container would be placed on a concrete foundation (9.5 feet wide, 20 feet long, and 8 feet tall). Each container holds the batteries, a supervisory and power management system, and a fire prevention system.	Please see proposed redline edits to the Site Certificate BESS description: Battery Energy Storage System (Lithium-ion, or similar alternate technology such as zinc-electrolyte) Approx. ~~total batteries~~ 604 total batteries ~~each~~ Site size (northern; southern) 10; 25 acres Approx. ~~total containers up to~~ 604 total containers ~~each~~ Approx. container dimensions 8 x 9.5 x 20 H x W x L (lithium-ion and zinc-electrolyte), feet Noise level (broadband) approximately 50-100 dBA The lithium ion (li-ion) and zinc-electrolyte, or similar alternate technology, battery energy storage system would be capable of storing and later deploying approximately 500 MW of energy generated by the solar facility. The main component of a typical battery system is the container. Within the container, battery cells are wired together to make up battery modules, which are then wired together to make up battery racks. Cells, modules, racks, and containers are combined in series and in parallel to achieve the required voltage and current output. Battery containers will include thermal management systems as required. ~~Li-ion battery systems are modular systems in which each module contains multiple smaller battery cells, each measuring up to 3.2 by 7 centimeters. The cells are the primary containment for the gel or liquid electrolyte materials. The module containing the cells is relatively small and serves as leak-proof secondary containment. Modules are placed in anchored racks within the concrete containers; typically, each rack houses 8 to 15 battery modules along with a switchgear assembly depending on the configuration chosen. Cooling units will be placed either on top of the concrete containers or along the side.~~ There are two approved locations for the battery storage units, one of the AC coupled battery storage sites would consist of up to 182 battery storage units located adjacent to the northern substation, occupying approximately 10 acres. The second of the two AC coupled battery storage sites would consist of up to 422 battery storage units and would be collocated with the southern substation, occupying approximately 25 acres. Both sites will be fenced separately from the solar array. The battery storage systems as a whole may use a series of self-

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			contained containers located within a fenced area or would be located within a single warehouse-type enclosure of a similar scale and size. ~~Each battery container would be placed on a concrete foundation (9.5 feet wide, 20 feet long, and 8 feet tall).~~ Each container holds the batteries, a supervisory and power management system, and ~~a~~ fire prevention systems as required.
	Confirm whether there are any differences in the manner in which the zinc bromide/electrolyte batteries will be stored. For example, will they still require cooling units either on top of the concrete containers or along the side? Per the ADR (p.4), the zinc electrolyte batteries don't require HVAC systems, so it is not clear whether those cooling units will be necessary. Confirm the location where the zinc bromide/electrolyte batteries could be located. Confirm the location of zinc bromide/electrolyte battery storage relative to the lithium-ion batteries.		Please see Attachment 1 of the Amendment Determination Request. The proposed zinc-electrolyte-based batteries do not require water use, nor HVAC systems; Simple fans will be utilized, otherwise no cooling units are proposed for the addition of the zinc-electrolyte-based batteries. Ancillary equipment within battery containers will be determined by final design and AHJ requirements. The footprint of the BESS has been previously provided and approved in the Final Order on the Application for Site Certificate. Exact locations within this footprint for both the lithium-ion and proposed zinc-electrolyte-based batteries (i.e., site plan) shall be provided during preconstruction compliance/final siting.
345-027-0350(4)(c)	Evaluate whether changing 15MW of lithium-ion batteries to zinc electrolyte-based, long duration Eos energy storage will impact the certificate holder's ability to comply with General Standard Condition 8 (provided in "Comments/Notes" column).	General Standard Condition 8 requires the certificate holder to design the battery storage system in accordance with the requirements of the National Fire Protection Association's (NFPA) 855: Standard for the Installation of Stationary Energy Storage Systems (NFPA, 2020) or most current version.	The proposed addition of the zinc-electrolyte-based batteries will not alter the Certificate Holder's ability to design the battery storage system in compliance with NFPA 855.
345-027-0350(4)(a); 345-022-0110 (impacts to fire protection services)	Explain and support the statement (ADR, p. 4) that the zinc bromide/electrolyte batteries are non-flammable. Describe the fire suppression measures that will be in place in the areas where lithium-ion batteries will be located and in areas where the zinc bromide/electrolyte batteries will be located.	The ADR describes that the proposed change in battery technology will not alter the facility's impact on public service providers. Please further explain the basis for that conclusion.	Fire safety measures within battery containers will be determined by final design and AHJ requirements.
345-027-0350(4)(c)	Explain why Waste Minimization Condition 1 would not have to be revised to account for the proposed use of the zinc electrolyte-based batteries.	Prior to facility operation, the certificate holder shall submit to the Department, for review and approval, an Operational Waste Management Plan. The Operational Waste Management Plan shall at a minimum include the following: a. All sources and quantities of operational waste and wastewater, including damaged or dysfunctional energy facility components, and where feasible, estimated quantities that can be recycled. b. A description of the battery replacement procedures. c. Identification of the availability of programs or licensed facilities that recycle solar panels and *lithium-ion* batteries and their capacity to accept materials. d. Identification of final recycling destination facility or program for recycling solar panels and *lithium-ion* batteries. e. If recycling programs or facilities are not available, the identification of final disposal destination facility or program for disposed solar panels and *lithium-ion* batteries and their capacity to accept waste.	a. Per Site Certificate Condition PRO-WM-01, "The Operational Waste Management Plan shall *at a minimum* include the following..", thus although zinc-electrolyte isn't explicitly outlined, it is reasonable to assume that the Site Certificate Condition PRO-WM-01 does not require an amendment; Lithium-ion batteries shall continue to make up a majority of the proposed Facility BESS. When the Operational Waste Management Plan is developed prior to operations, relevant battery technologies and associated measures shall be addressed as applicable.

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		(Emphasis added).	
345-027-0350(4)(a); 345-022-0050 (impacts on retirement estimate)	The Final Order, Table 8 estimates the cost of Battery Removal and Disposal to be $992,255.00 (Q2 2024 Dollars). Please confirm whether the proposed use of the zinc bromide/electrolyte batteries will impact this estimate, and if so, provide a revised estimate. If there is no impact to the estimate, explain how this was determined.		The proposed addition of the zinc-electrolyte-based batteries will not alter the estimated decommissioning costs. The estimate includes battery recycling as a cost per ton. The battery tonnage per MW is a worse case conservative estimate developed by reviewing different technologies.