

# Riverside Energy Park

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## Report on Shading Effects to Crossness Local Nature Reserve

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Revision 1 (Deadline 3)

APFP Regulation 5(2)(q)

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Planning Act 2008 | Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

# TECHNICAL NOTE

**Job Name:** Riverside Energy Park  
**Job No:** 42166  
**Note No:** 8.02.10  
**Date:** 12/06/19 (Deadline 3 Submission)  
**Prepared By:** Duncan McLaughlin  
**Subject:** **Report on Shading Effects to Crossness Local Nature Reserve (LNR)**

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## Introduction

- 1.1.1 **Paragraph 11.9.33 of Chapter 11 Terrestrial Biodiversity of Environmental Statement (ES) (6.1, REP2-023)** discusses the potential for significant effects to designated areas from shading from the Main REP Building.

*“Impacts to designated areas from shading of the REP building have been modelled using interactive three-dimensional graphics (Figure 11.11). The results indicate that marginal areas of Crossness LNR and Erith Marshes SINC would be subject to some shading, in particular after dawn during the period March to September. The affected areas are small in size and as the sun moves through the sky will be shaded for only a short duration each day. Whilst there is potential for some minor changes in the botanical assemblage in these areas as a result of shading, this is considered to be unlikely. Therefore, effects from shading to Crossness LNR of County/Metropolitan importance, and Erith Marshes SINC of Local conservation importance, will be Not Significant.”*

- 1.1.2 Thames Water Utilities Limited (TWUL) included the following points on shading effects to Crossness Local Nature Reserve (LNR) within their Relevant Representation.

*“Due to the height and proximity of the proposed development adjacent to Crossness Nature Reserve it is considered that it will have significant shading impacts. Water Vole-populated ditches will be shaded, and the shading could also alter the species composition botanically, particularly the rare Dittander which would be shaded by the data centres.”*

- 1.1.3 In response to TWUL’s concerns, the Applicant has undertaken further assessment of shading effects to Crossness LNR. This has included further 3-dimensional modelling of the shadow cast across Crossness LNR from the Main REP Building, along with a commentary on potential ecological effects to the LNR.

# TECHNICAL NOTE

## Methodology

- 1.1.4 The extents of likely shadow cast by the Main REP Building have been modelled using 3D CAD<sup>1</sup> software. A series of images have been generated which show the likely shadow cast from the Main REP Building (based on an emerging illustrative design within the parameters secured under the draft Development Consent Order (dDCO) and in accordance with the Design Principles also secured under the dDCO) at different times between dawn and dusk. Images showing the indicative shadow cast during a range of months across the year (March, June, September and December) are presented in **Appendix A**.
- 1.1.5 The assessment has been undertaken on the basis of the illustrative stepped building form as outlined in **Section 6.4** of the **Design and Access Statement (7.3, APP-104)**.
- 1.1.6 The current assessment provides a reasonable representation of the likely shadow cast from the Main REP Building based on the illustrative stepped building form. The shading effects of existing buildings are also taken into account in the assessment.

## Assessment of Shading Effects

- 1.1.7 The shadow modelling images demonstrate that shadows from the Main REP Building are at their largest extent across Crossness LNR just after dawn as the sun rises in the east, casting shadows to the west. As the sun moves higher in the sky during the morning, the shadows quickly move across Crossness LNR, and the extent of shading reduces. The modelling demonstrates that shadows are no longer cast on Crossness LNR by around early to mid-morning (with the exact times varying throughout the year).
- 1.1.8 Shadow modelling images also demonstrate that in the evenings as the sun sets in June, the Main REP Building casts a shadow to the southeast over the north eastern field within the Crossness LNR, adjacent to Norman Road. The extent of these shadows in the evening are very small, only covering the ditch and field margin.
- 1.1.9 As shown on **Image 1** below, the intensity of the sun varies throughout the day, with the least solar radiation received at dawn and dusk, and the most solar radiation at midday. The shading images demonstrate that shading to Crossness LNR from REP will be at its greatest extent around dawn, when the intensity of the sun is at its lowest, and therefore has the lowest influence on plant growth. Through the morning the extent of shading reduces as the intensity of the sun increases, and by mid-morning shadows have left the Crossness LNR.

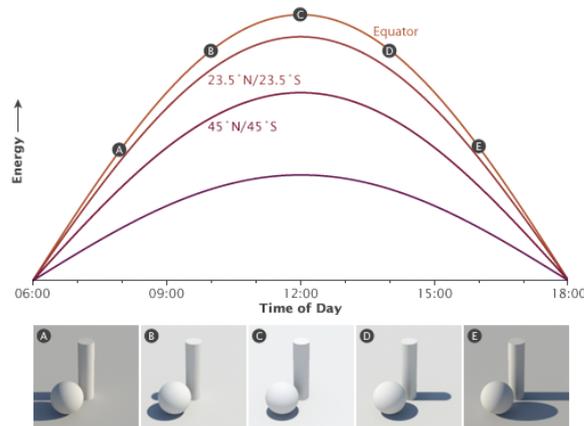
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<sup>1</sup> The REP model, surrounding buildings and area within the solar study images were produced in Bentley Microstation V8i Select Series 4. The model was imported into the SketchUp Pro 2018 software program where it was Geolocated using geographic co-ordinates within the software which can create realistic solar shadow studies taking into account Co-ordinated Universal Time (UTC) for different times of the year.

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1.1.10 There is no shading to the Crossness LNR during the period of the day when the sun's intensity is highest, the time of day when plants will be growing most actively.

Image 1. Variation of solar radiation throughout the day by time and latitude <sup>2</sup>



The solar radiation received at Earth's surface varies by time and latitude. This graph illustrates the relationship between latitude, time, and solar energy during the equinoxes. The illustrations show how the time of day (A-E) affects the angle of incoming sunlight (revealed by the length of the shadow) and the light's intensity. On the equinoxes, the Sun rises at 6:00 a.m. everywhere. The strength of sunlight increases from sunrise until noon, when the Sun is directly overhead along the equator (casting no shadow). After noon, the strength of sunlight decreases until the Sun sets at 6:00 p.m. The tropics (from 0 to 23.5° latitude) receive about 90% of the energy compared to the equator, the mid-latitudes (45°) roughly 70%, and the Arctic and Antarctic Circles about 40%. (NASA illustration by Robert Simmon.)

1.1.11 Shadow modelling images demonstrate that shadows will move across the Crossness LNR throughout the morning, as the sun moves along its trajectory through the sky. As the location of the sun changes, so will the location and size of the shadow which would be cast onto the Crossness LNR. This means that no single area will be subject to shading for long periods, as the shadows move across the Crossness LNR.

1.1.12 The active growing season of plants is the period of year when climatic conditions permit normal plant growth. This will vary from species to species, but for most plant species the growing season can broadly be attributed to approximately April to September inclusive<sup>3</sup>. This is also the period of the year when the sun is highest in the sky meaning that shading to the LNR will be less pronounced. This is supported by shadow modelling images which demonstrate that shading impacts to Crossness LNR are shortest, relative to day length, during the period March – September.

1.1.13 TWUL also raised in their relevant representation the possibility that ditches could become unsuitable to support water vole, a species known to be present in the ditch systems within Crossness LNR. As shading from the Main REP Building will be largely limited to the early mornings, and there will be no shading during the

<sup>2</sup> <https://earthobservatory.nasa.gov/features/EnergyBalance/page2.php> (accessed 08/05/19)

<sup>3</sup> Department of Energy & Climate Change (2013). Thermal growing seasons in central England

## TECHNICAL NOTE

middle part of the day when the majority of solar radiation is received by earth, it is not considered likely that there will be any significant changes to ditch habitats within the Crossness LNR which could affect water voles. The images show that ditches which currently support water voles are subject to some shading in the evening from the existing Thames Water Sewage Sludge Incinerator. This further supports the assessment above that there will not be any significant changes to ditch habitats within the Crossness LNR which could affect water voles.

- 1.1.14 TWUL also raised concerns in relation to shading of Dittander from the data centres, located along Norman Road to the south east of the Main REP Building. The Data Centres are a consented project and fall outside the scope of the Application and its shadow modelling assessment, apart from in relation to potential cumulative effects. Although the Data Centres are not shown on the shadow modelling images, the shadows from the Main REP Building predominantly fall to the west of the Main REP Building, and the Data Centres are located to the southeast of the Main REP Building along Norman Way. Therefore the majority of shading from each facility would not affect the same area of Crossness LNR. The assessment above demonstrates that shading will be limited to periods of the day of lowest light intensity, and the existing shading has had no perceptible effect on habitats or protected species. Therefore, there would be no significant cumulative effects from shading from REP and the Data Centres.
- 1.1.15 Environmental information for the Data Centre (including a shading analysis) was also submitted to and considered by the Local Planning Authority in approving that particular development.

### Conclusion

- 1.1.16 This assessment has looked at the potential for effects to Crossness LNR from shading from the Main REP Building.
- 1.1.17 The assessment has been undertaken on the basis of the illustrative stepped building form as outlined in **Section 6.4** of the **Design and Access Statement (7.3, APP-104)**.
- 1.1.18 The current assessment provides a reasonable representation of the likely shadow cast from the Main REP Building based on the illustrative stepped building form. The shading effects of existing buildings are also taken into account in the assessment.
- 1.1.19 The assessment has demonstrated that due to the location, extent and duration of the shading, significant changes to habitats within the Crossness LNR, and species which they support are unlikely, and therefore the conservation status of Crossness LNR will not be affected.
- 1.1.20 The assessment supports the conclusion of the ES in that *“Whilst there is potential for some minor changes in the botanical assemblage in these areas as a result of shading, this is considered to be unlikely. Therefore, effects from shading to Crossness LNR of County/Metropolitan importance, and Erith Marshes SINC of Local conservation importance, will be Not Significant”*.

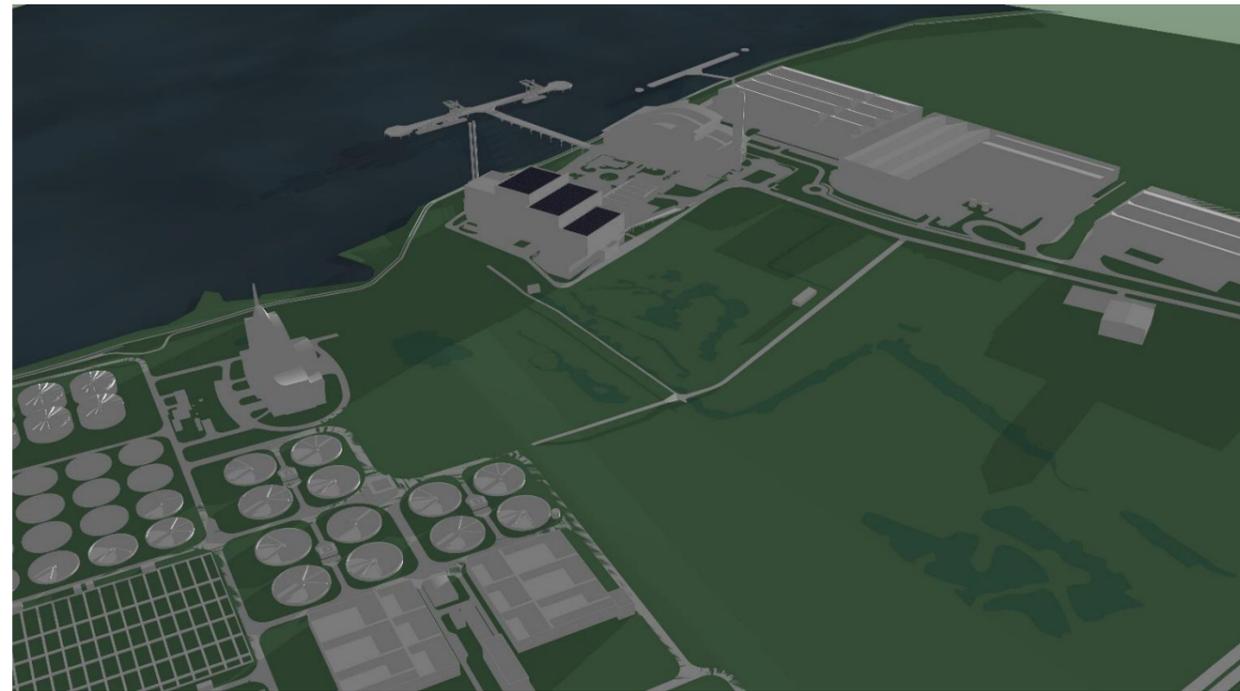
## TECHNICAL NOTE

### Appendix A Shadow Modelling Images

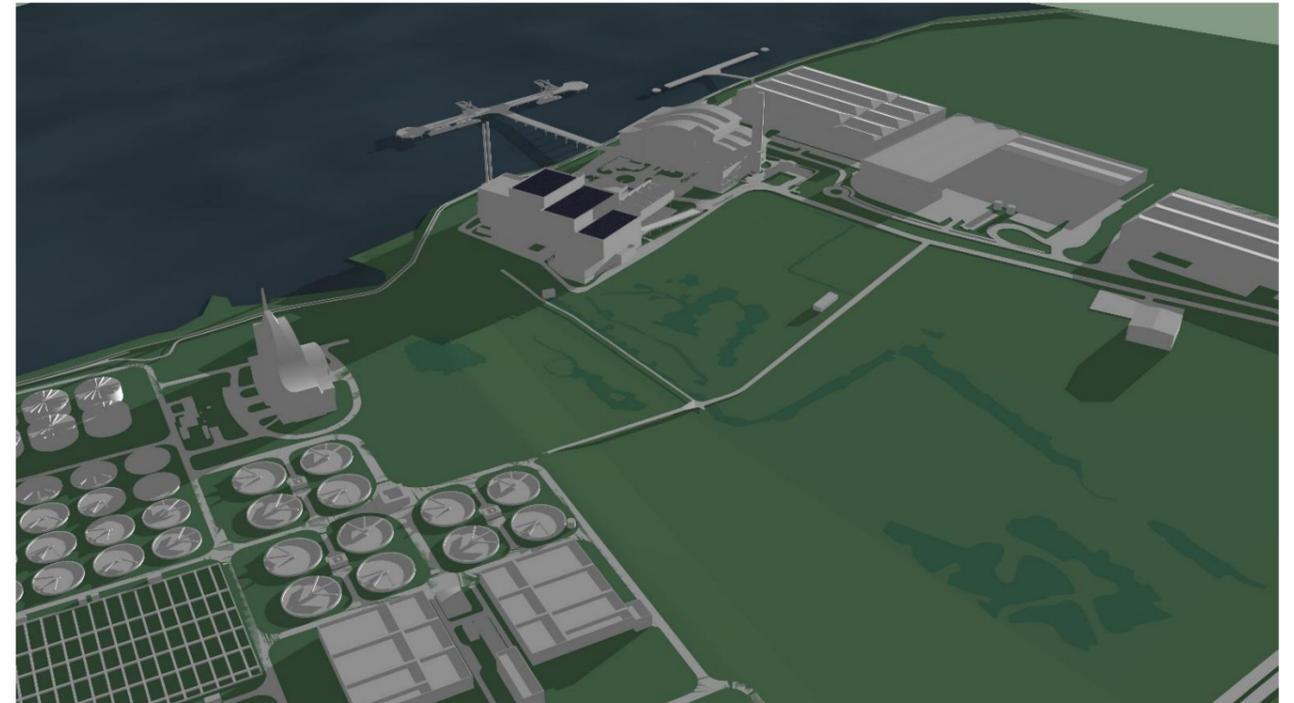
**IMPORTANT NOTE:** the contrast of the images has been increased to ensure the extent of shading is clearly visible to the reader, and therefore the areas of shadow are darker on the images than would be expected in reality.

# TECHNICAL NOTE

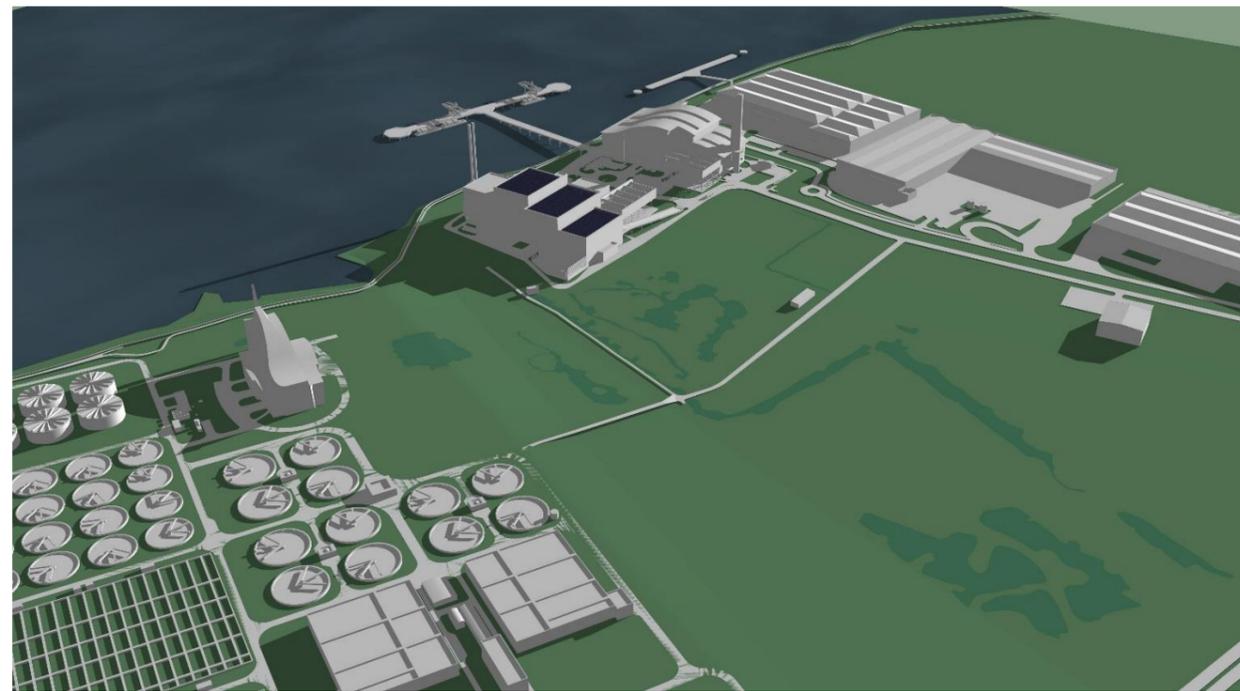
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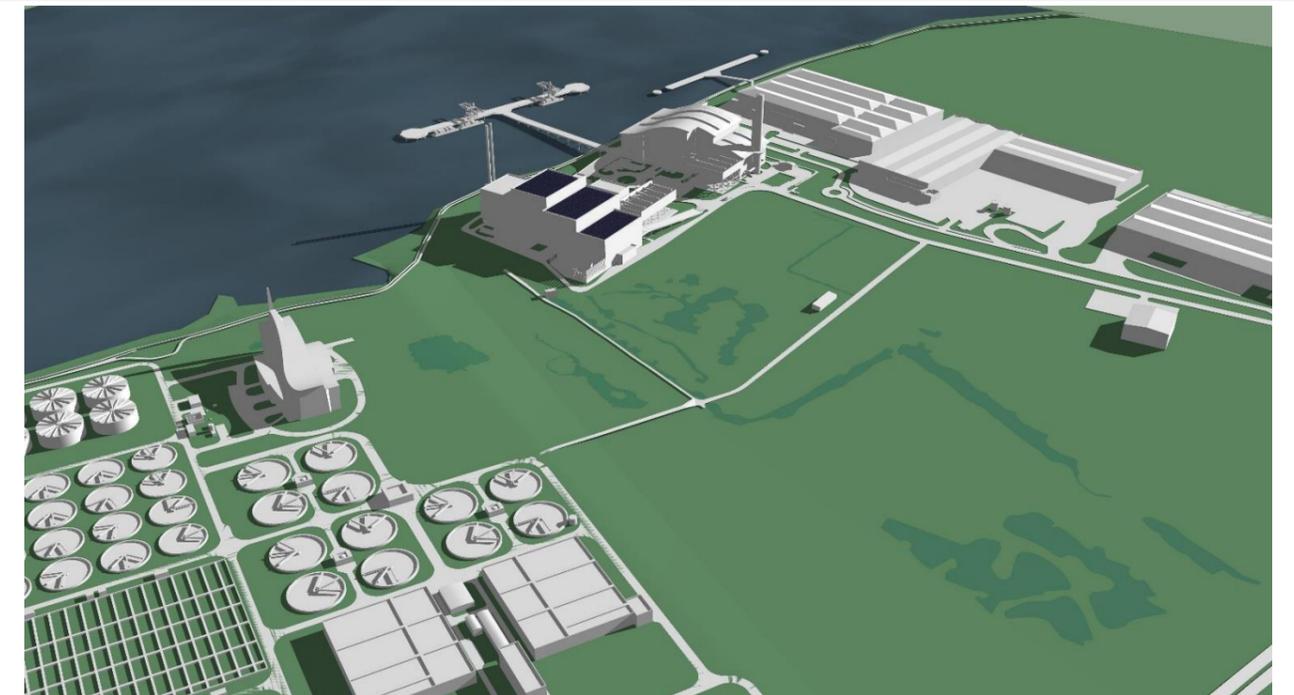
March 21<sup>st</sup> – 06:30



March 21<sup>st</sup> – 07:00



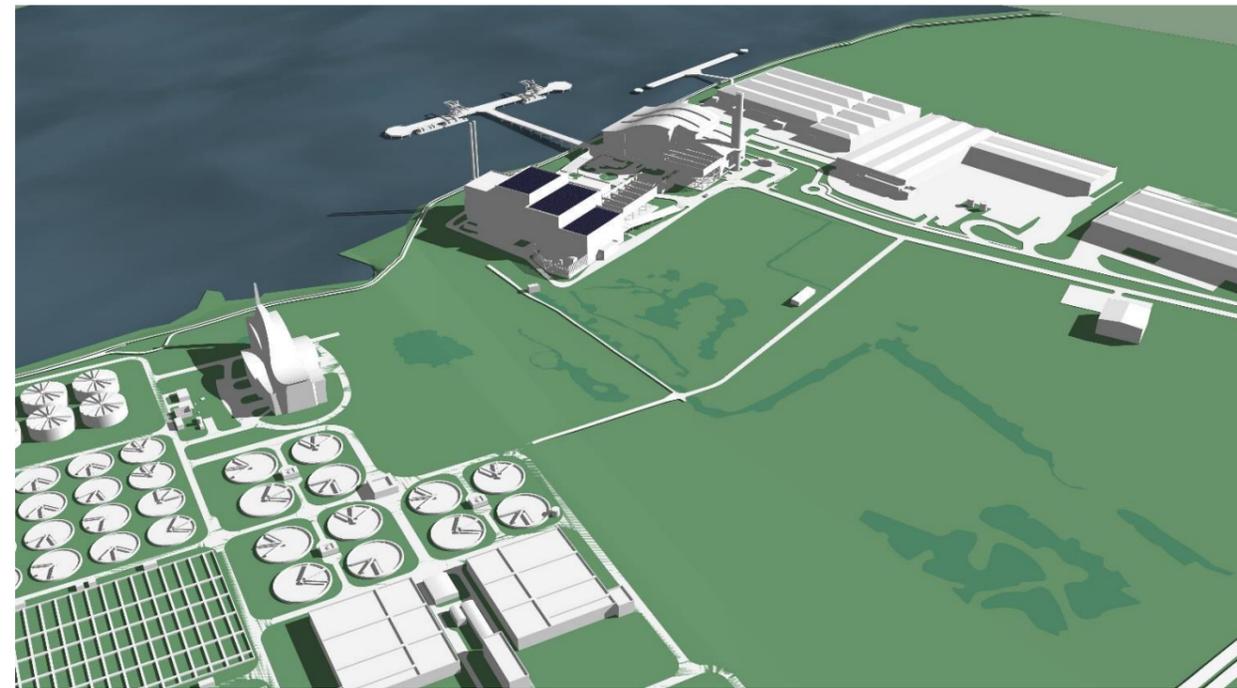
March 21<sup>st</sup> – 08:00



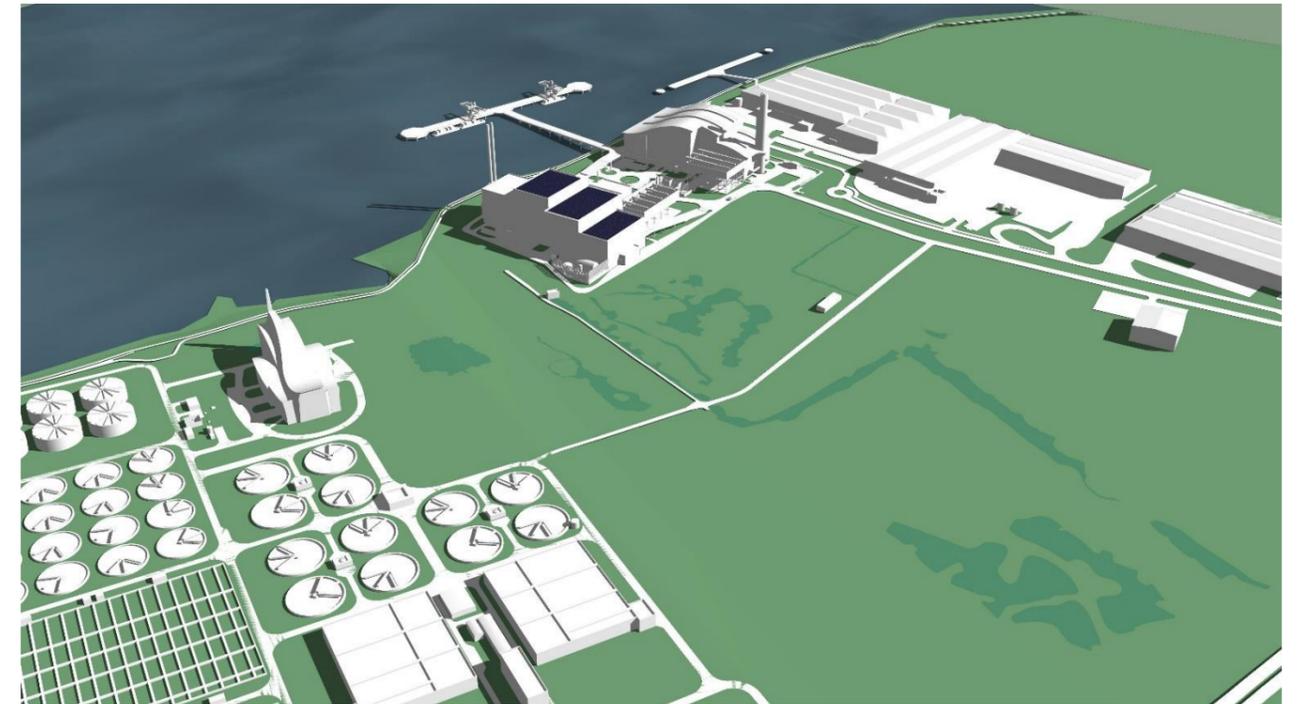
March 21<sup>st</sup> – 09:00

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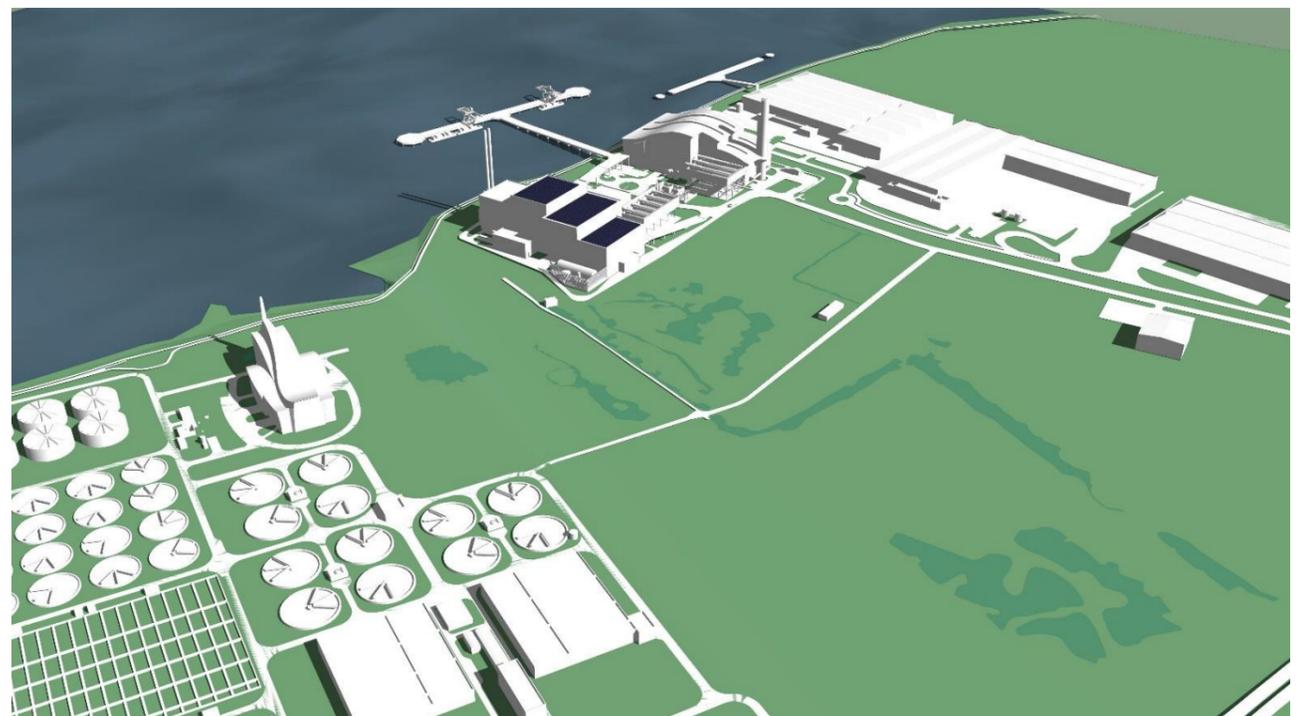
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March 21<sup>st</sup> – 10:45



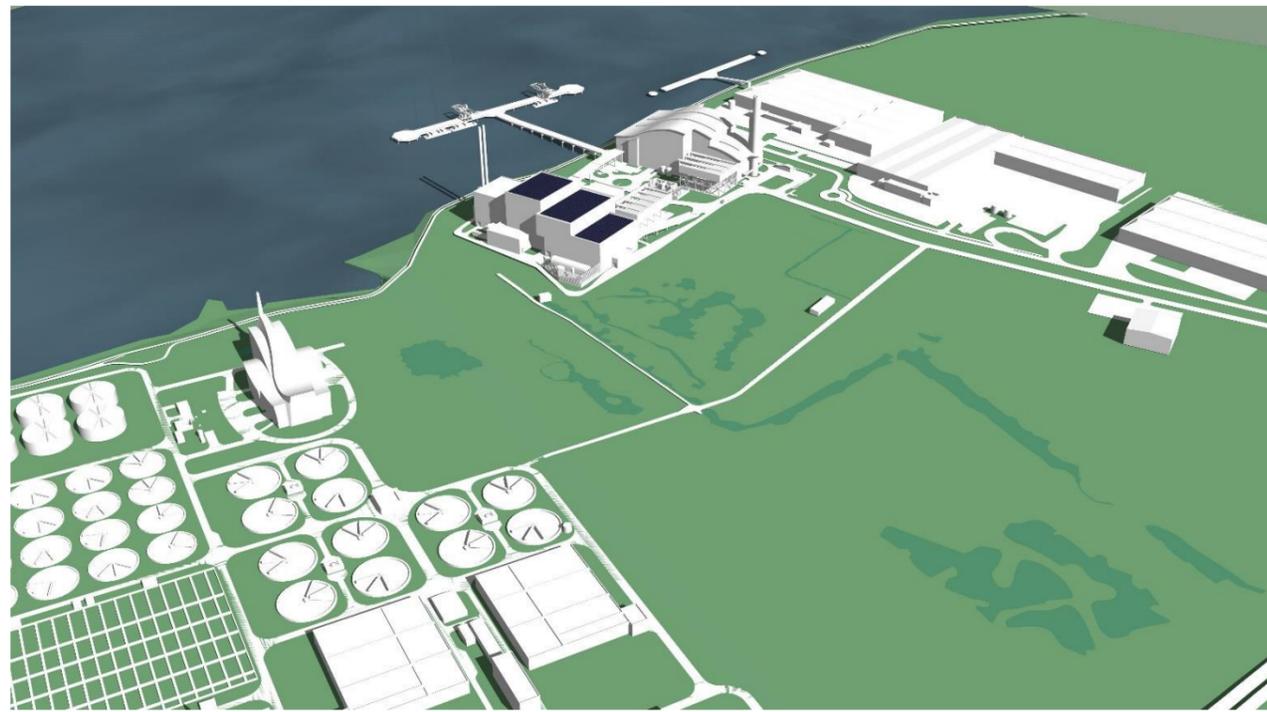
March 21<sup>st</sup> – 11:00



March 21<sup>st</sup> – 12:00

# TECHNICAL NOTE

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March 21<sup>st</sup> – 13:00



March 21<sup>st</sup> – 15:00



March 21<sup>st</sup> – 16:00



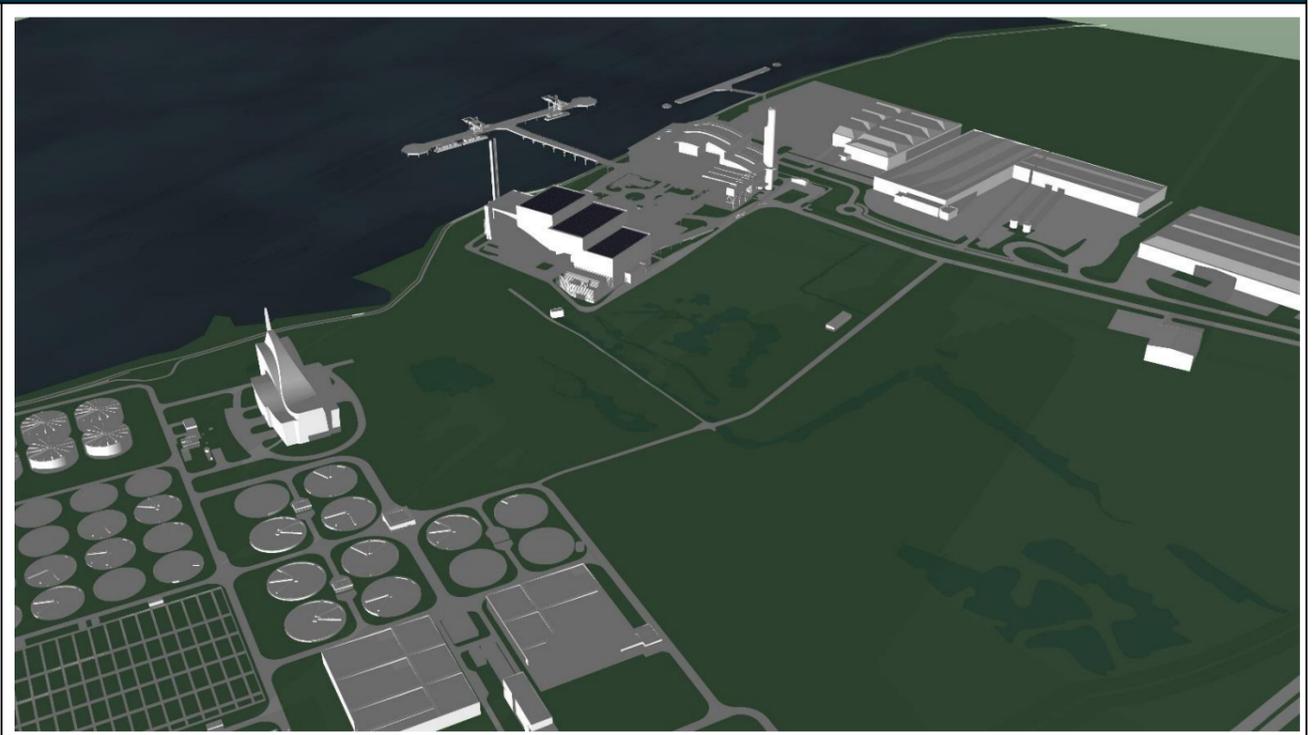
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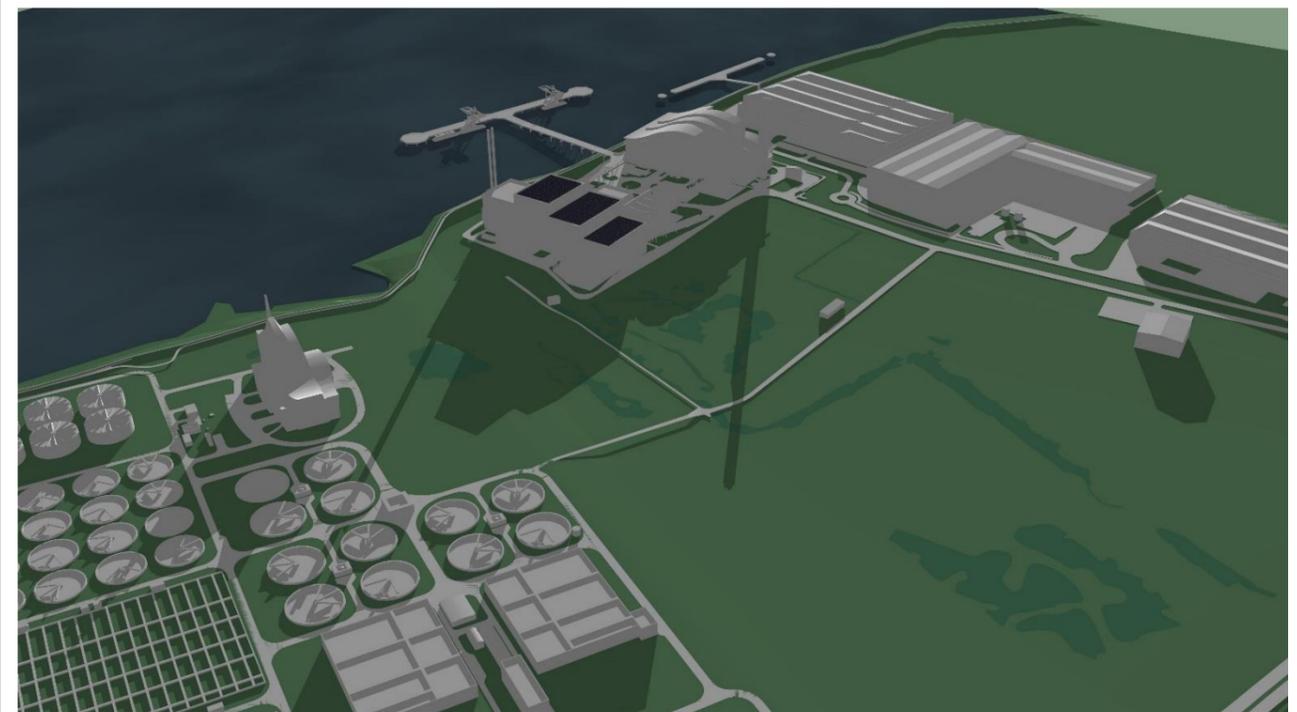
March 21<sup>st</sup> – 18:00

TECHNICAL NOTE

June



June 21<sup>st</sup> – 05:15



June 21<sup>st</sup> – 06:00



June 21<sup>st</sup> – 07:00



June 21<sup>st</sup> – 08:00

# TECHNICAL NOTE

June



June 21<sup>st</sup> – 09:00



June 21<sup>st</sup> – 10:00



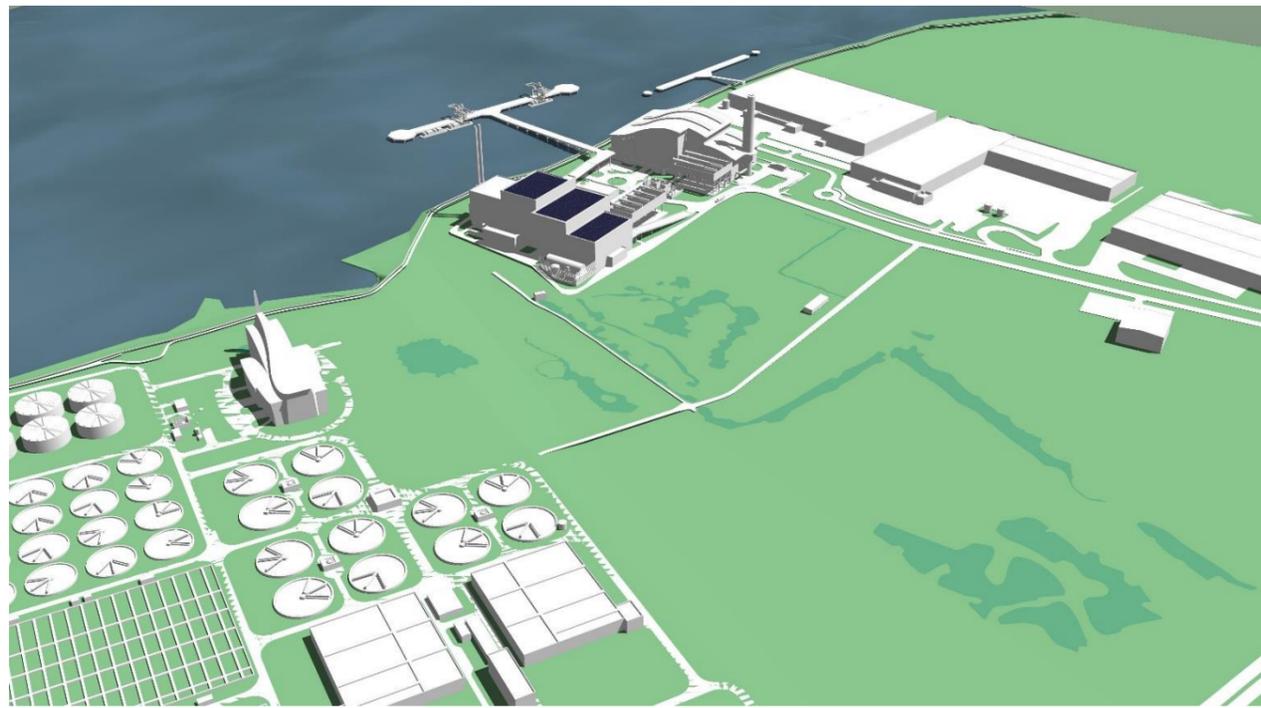
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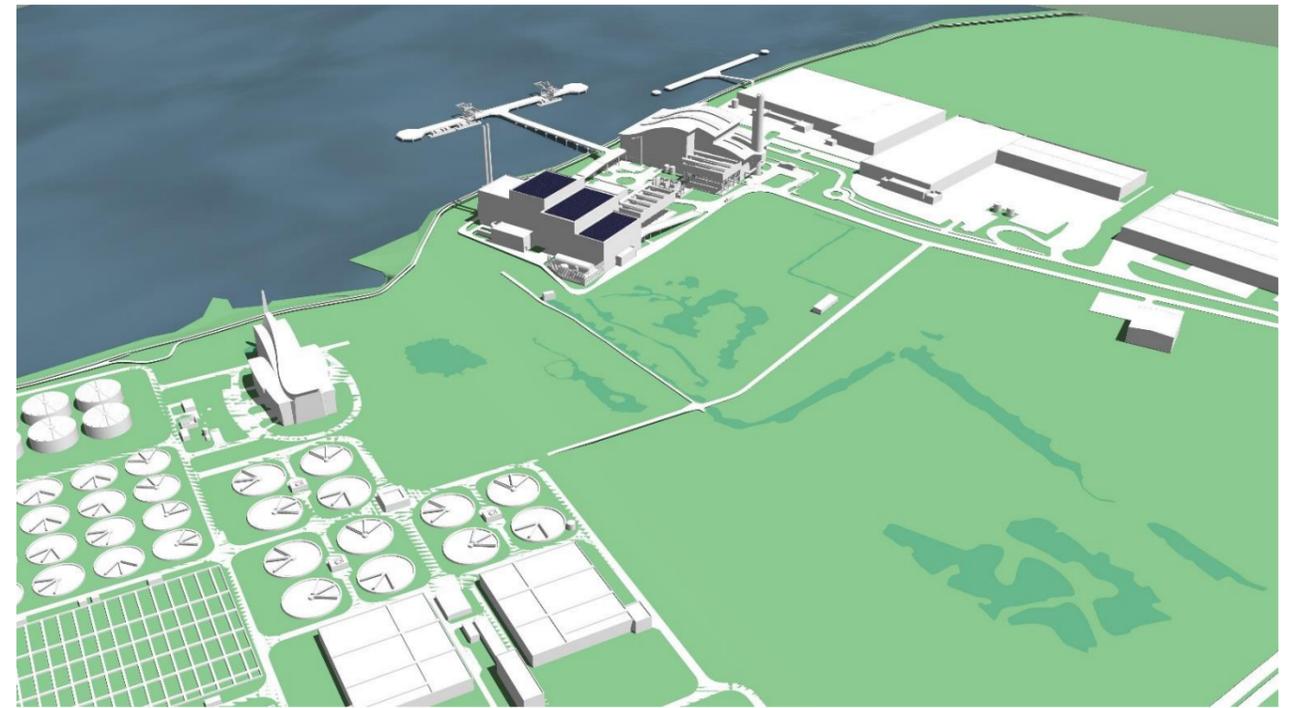
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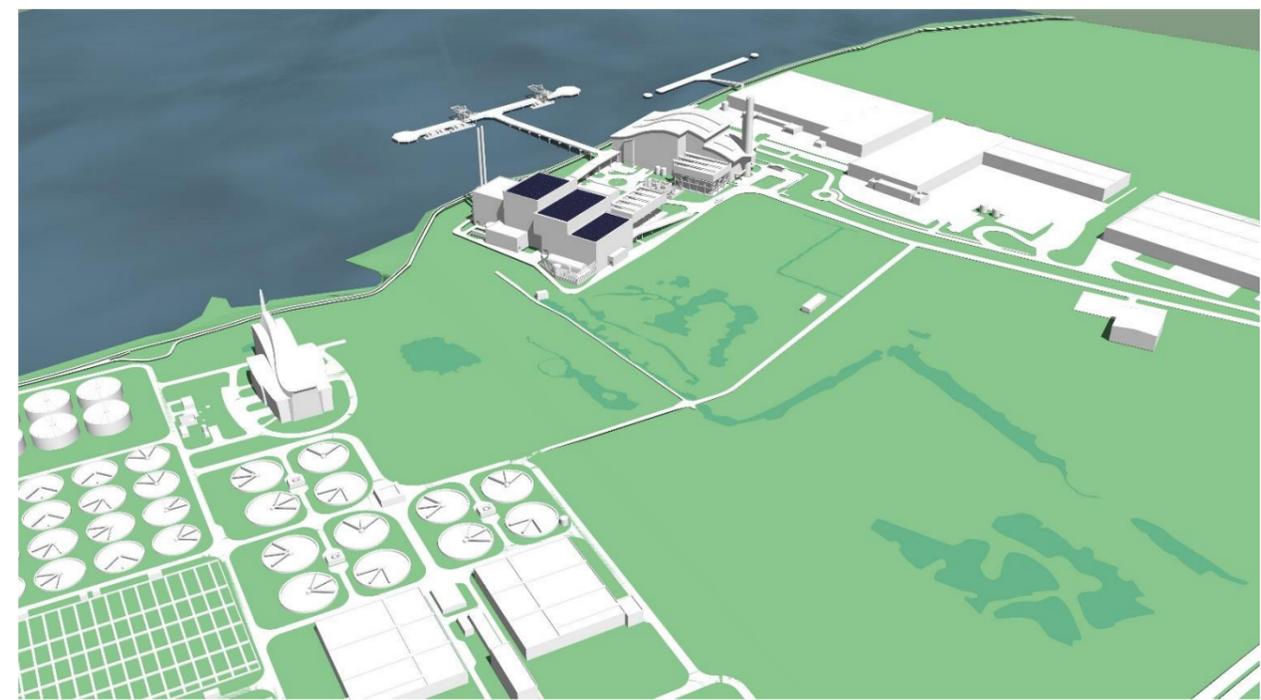
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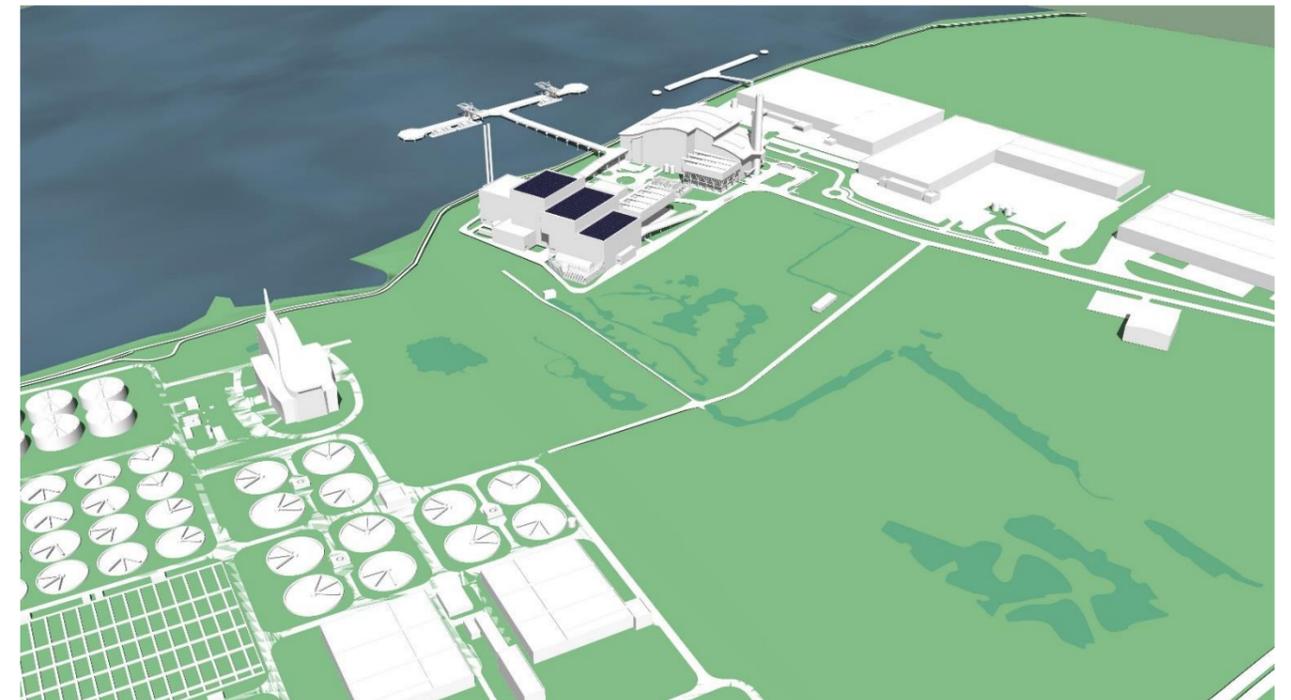
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June 21<sup>st</sup> – 13:00



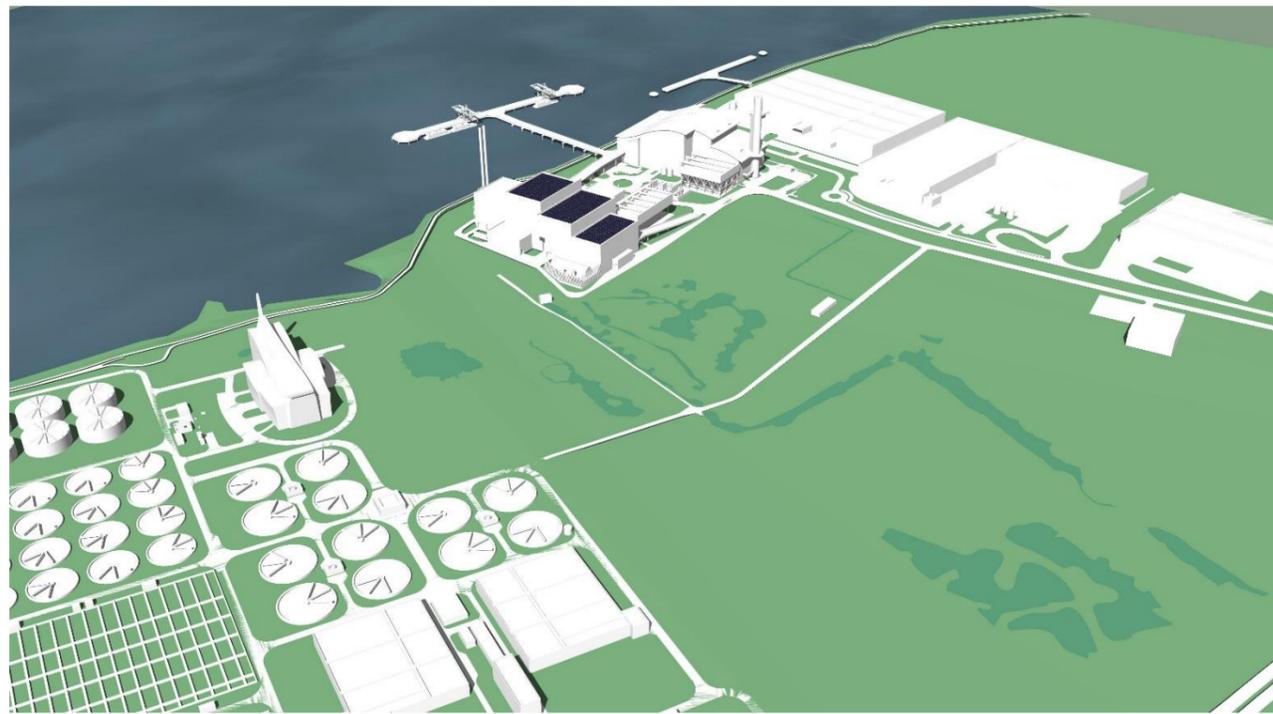
June 21<sup>st</sup> – 14:00



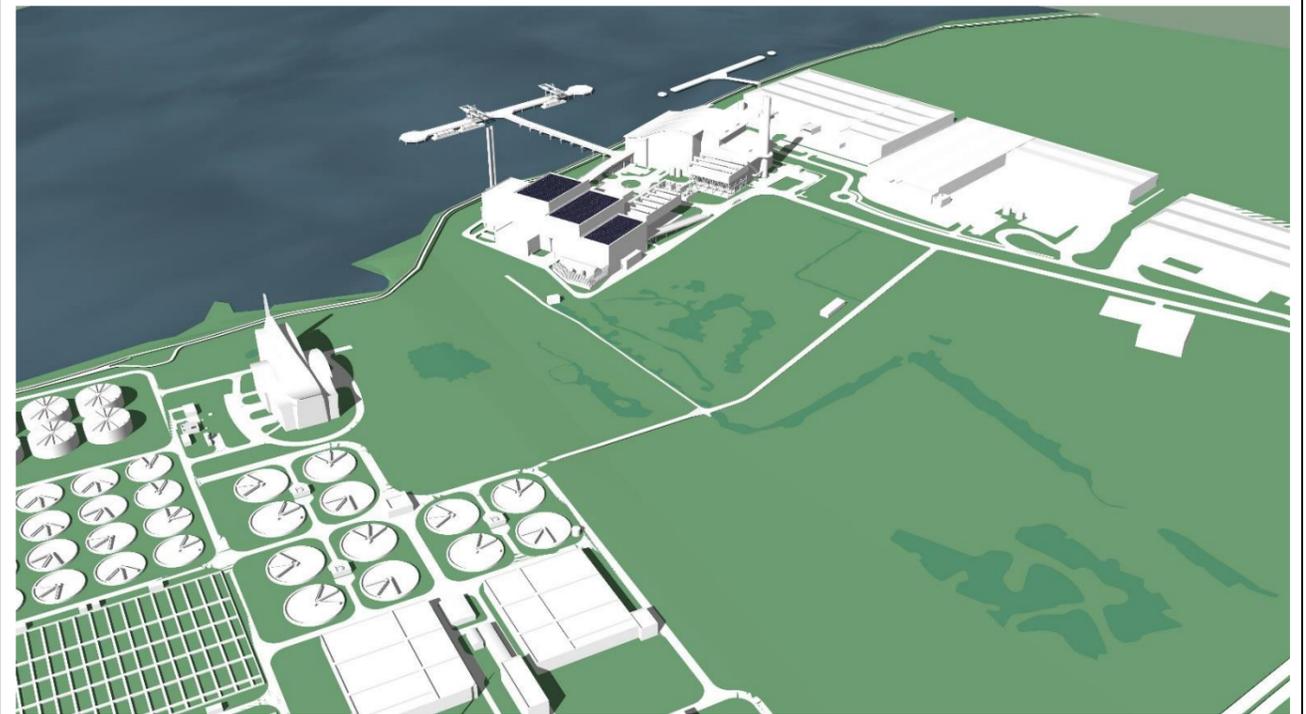
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# TECHNICAL NOTE

June



June 21<sup>st</sup> – 16:00



June 21<sup>st</sup> – 17:00



June 21<sup>st</sup> – 18:00



June 21<sup>st</sup> – 19:00

# TECHNICAL NOTE

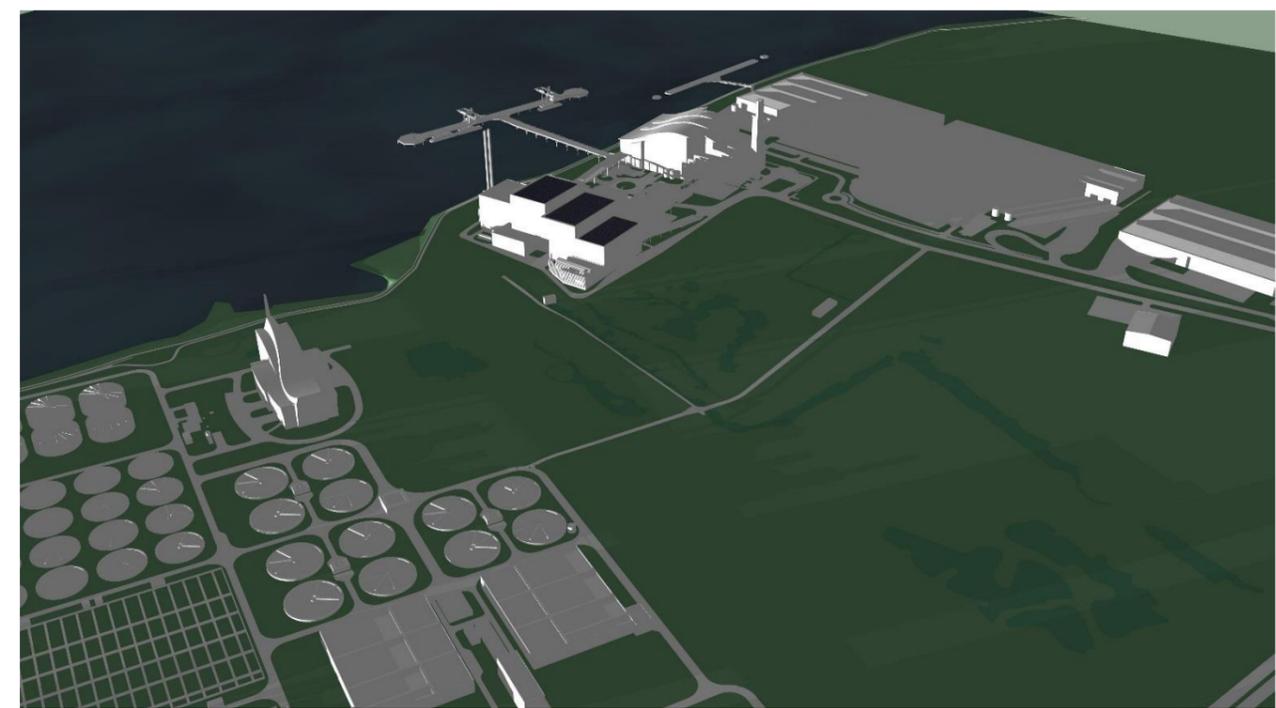
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June 21<sup>st</sup> – 19:05



June 21<sup>st</sup> – 20:00



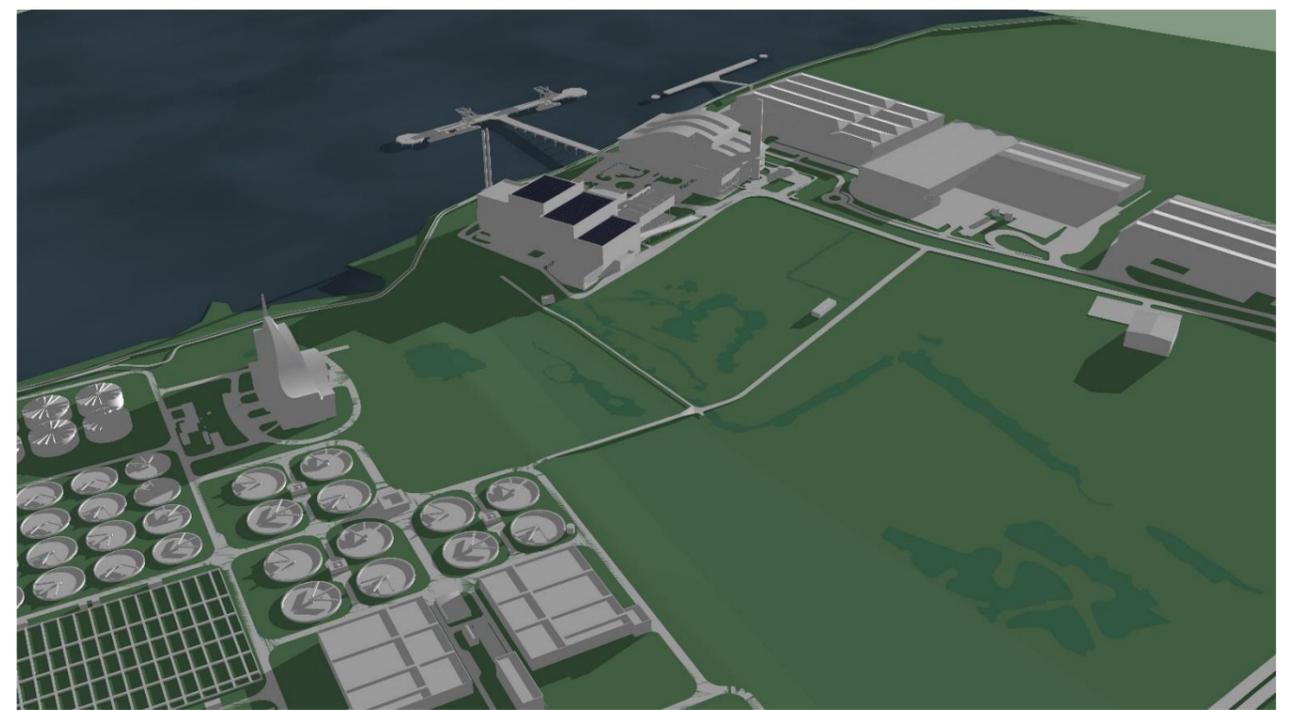
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TECHNICAL NOTE

September



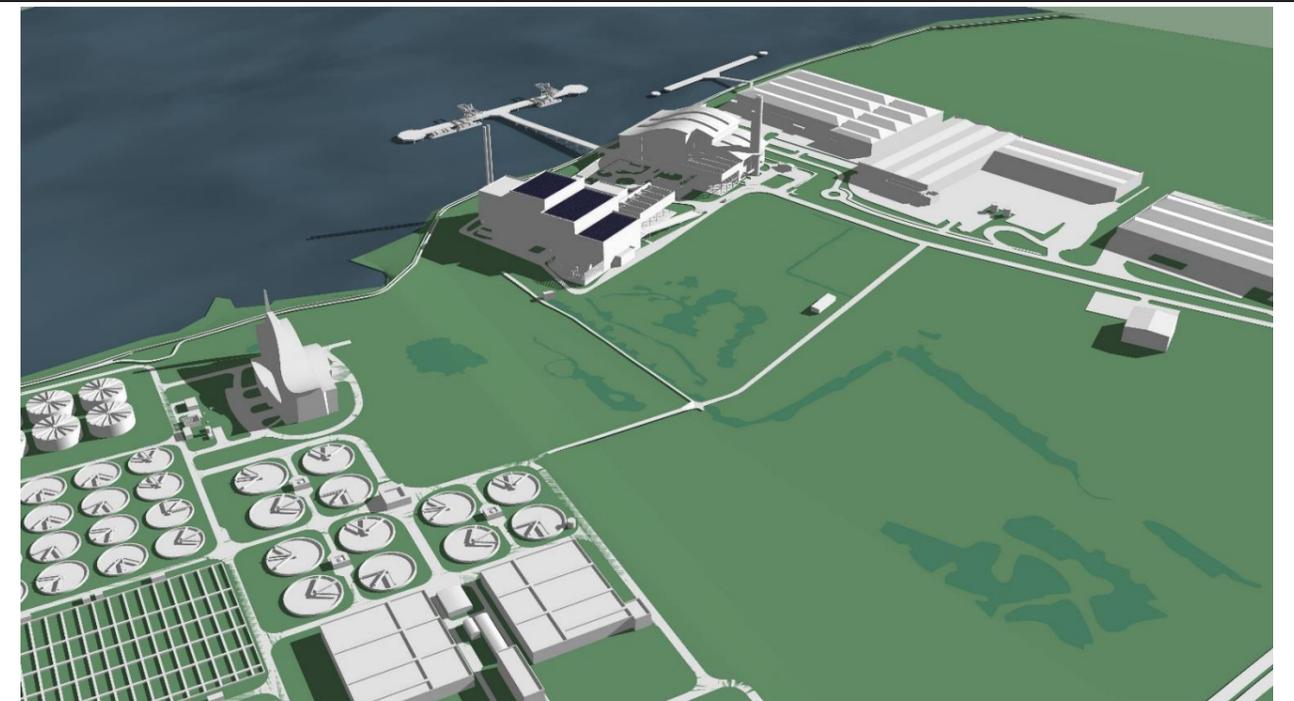
September 21<sup>st</sup> – 07:00



September 21<sup>st</sup> – 08:00



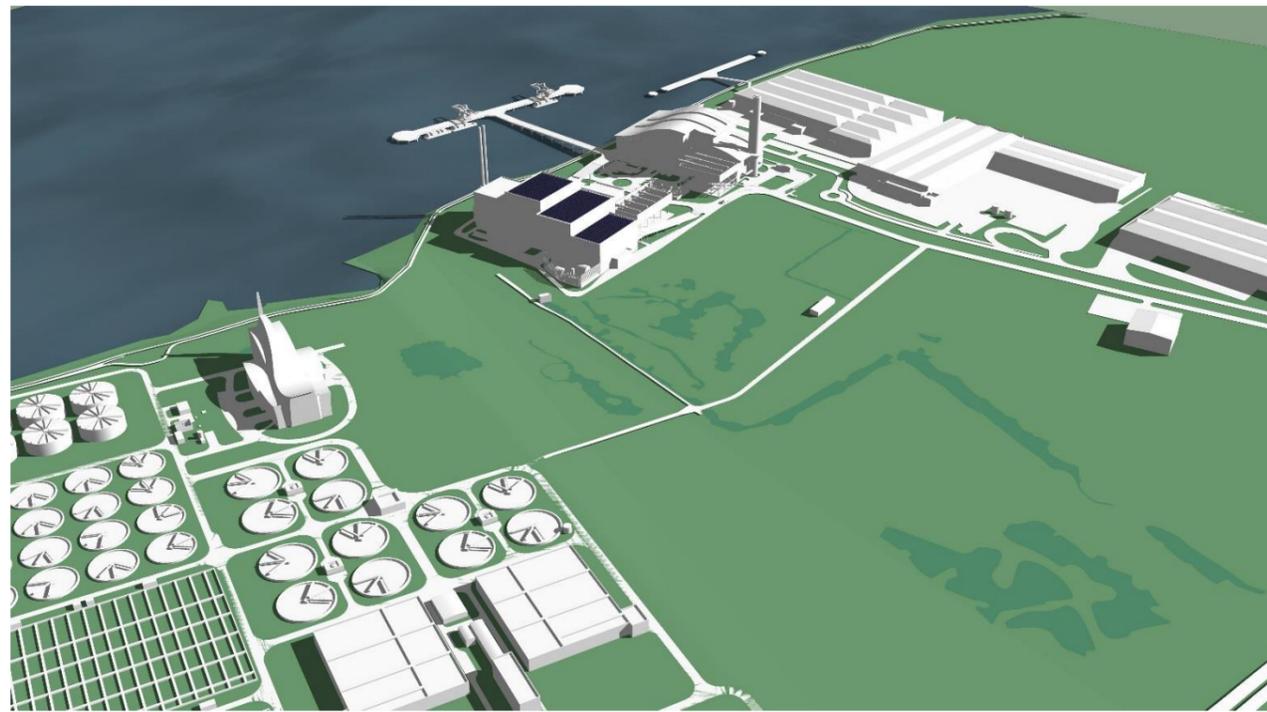
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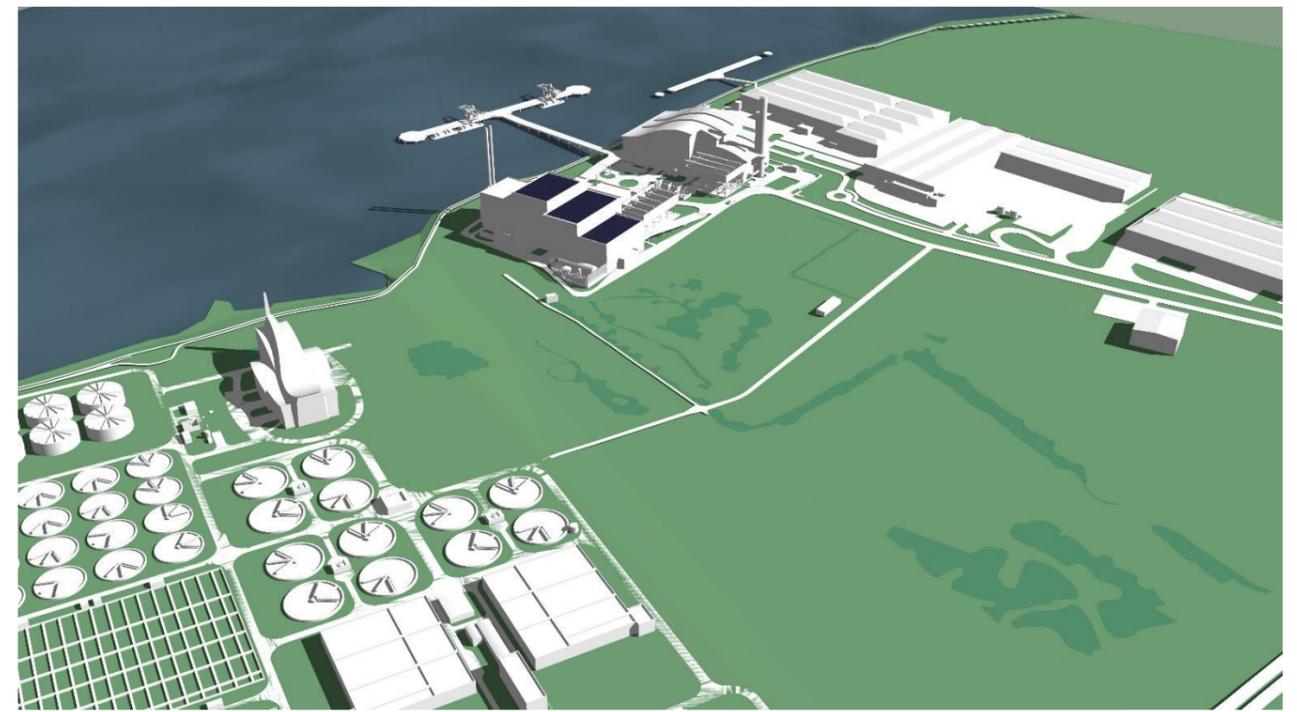
September 21<sup>st</sup> – 10:00

# TECHNICAL NOTE

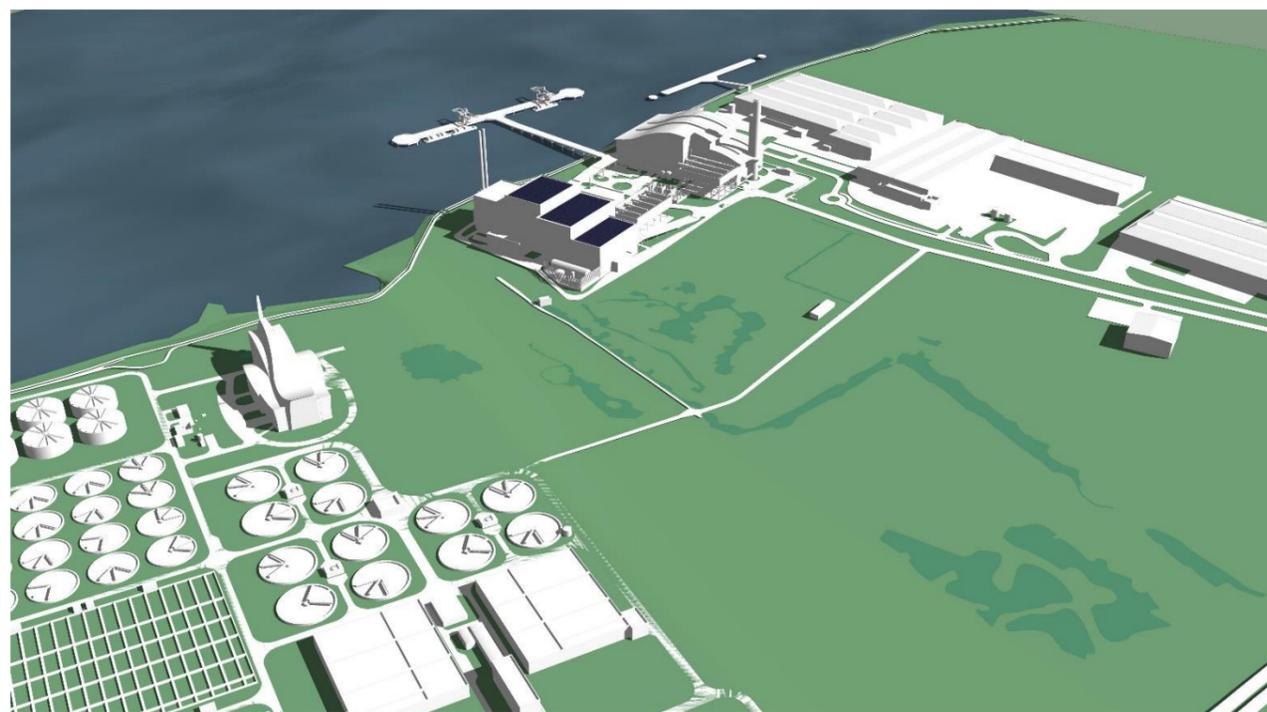
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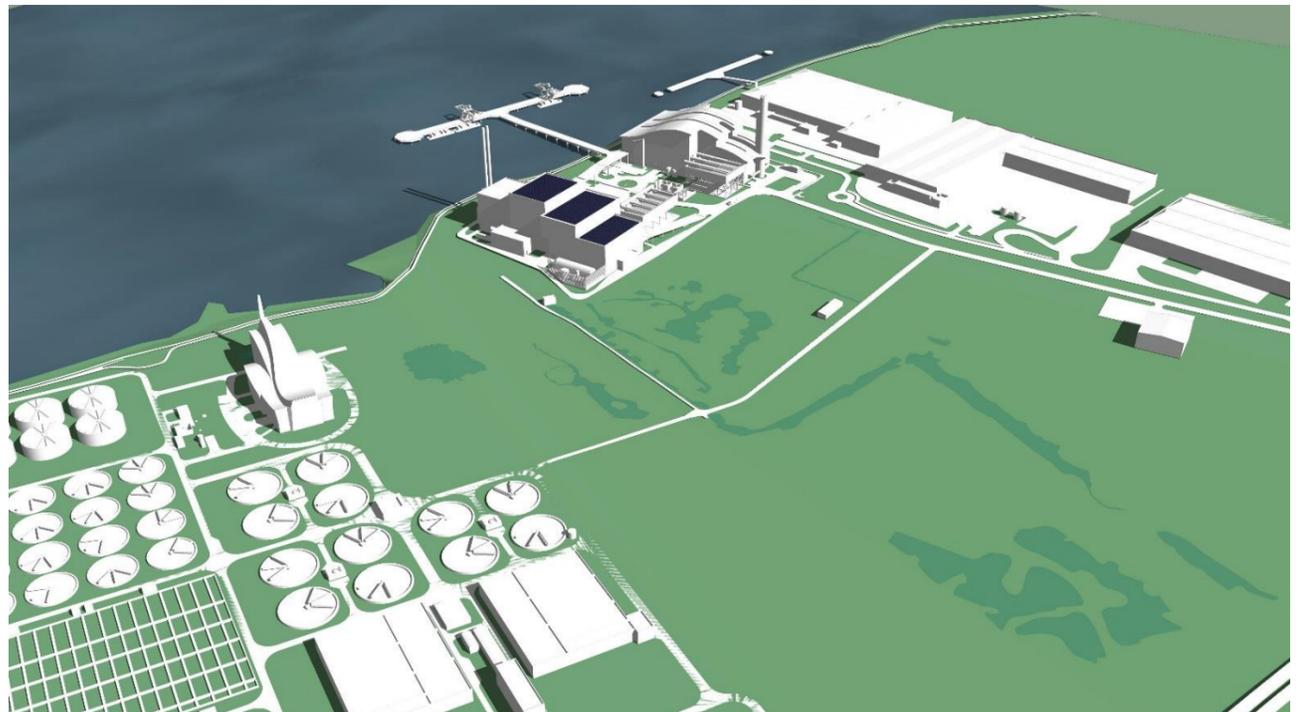
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September 21<sup>st</sup> – 11:35



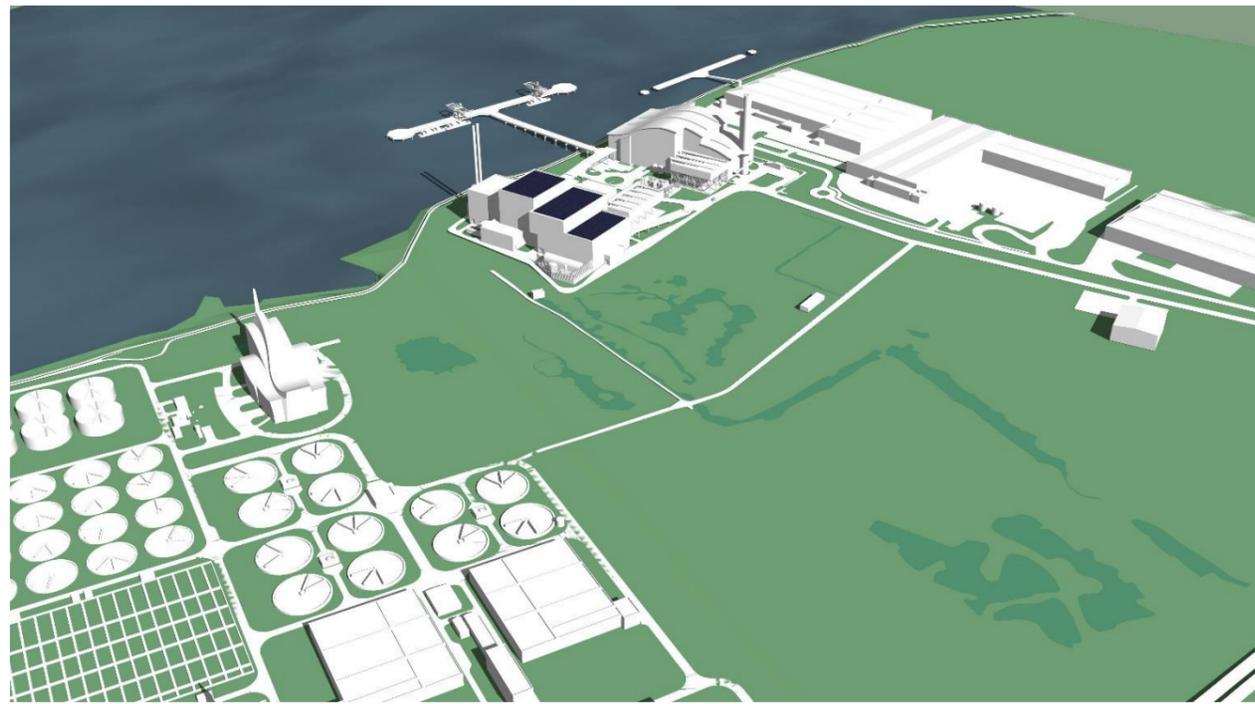
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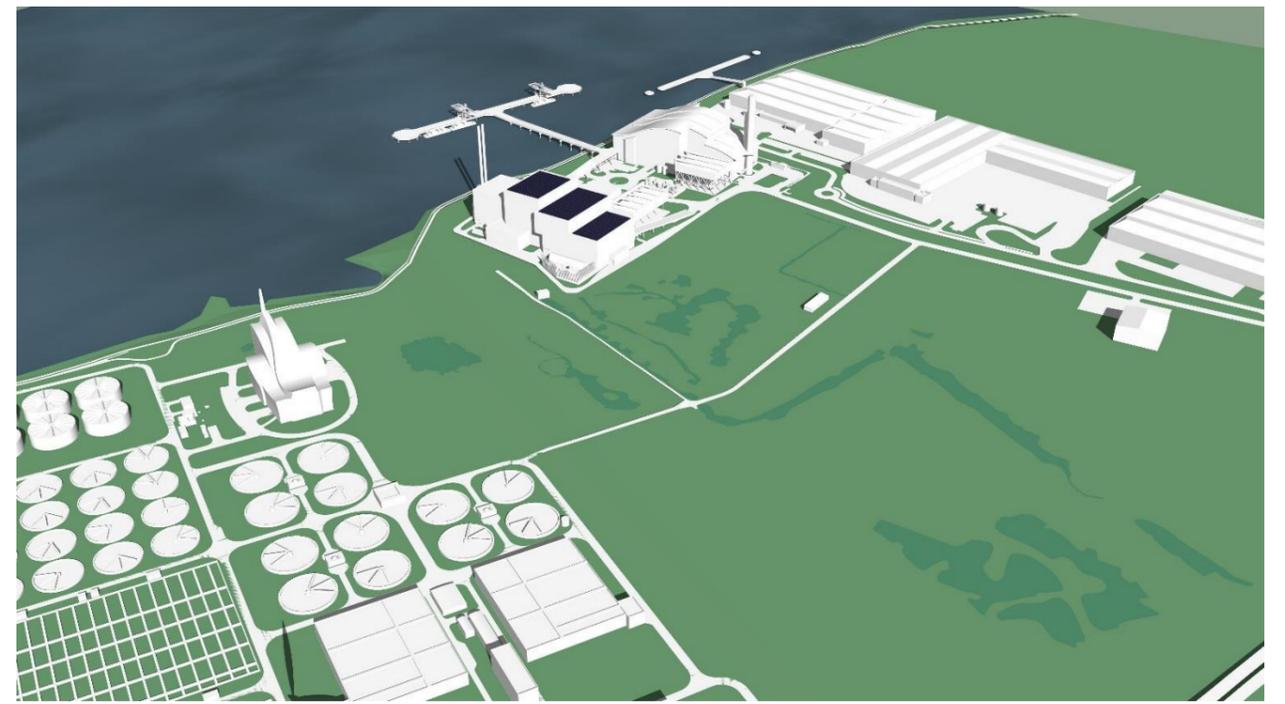
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September



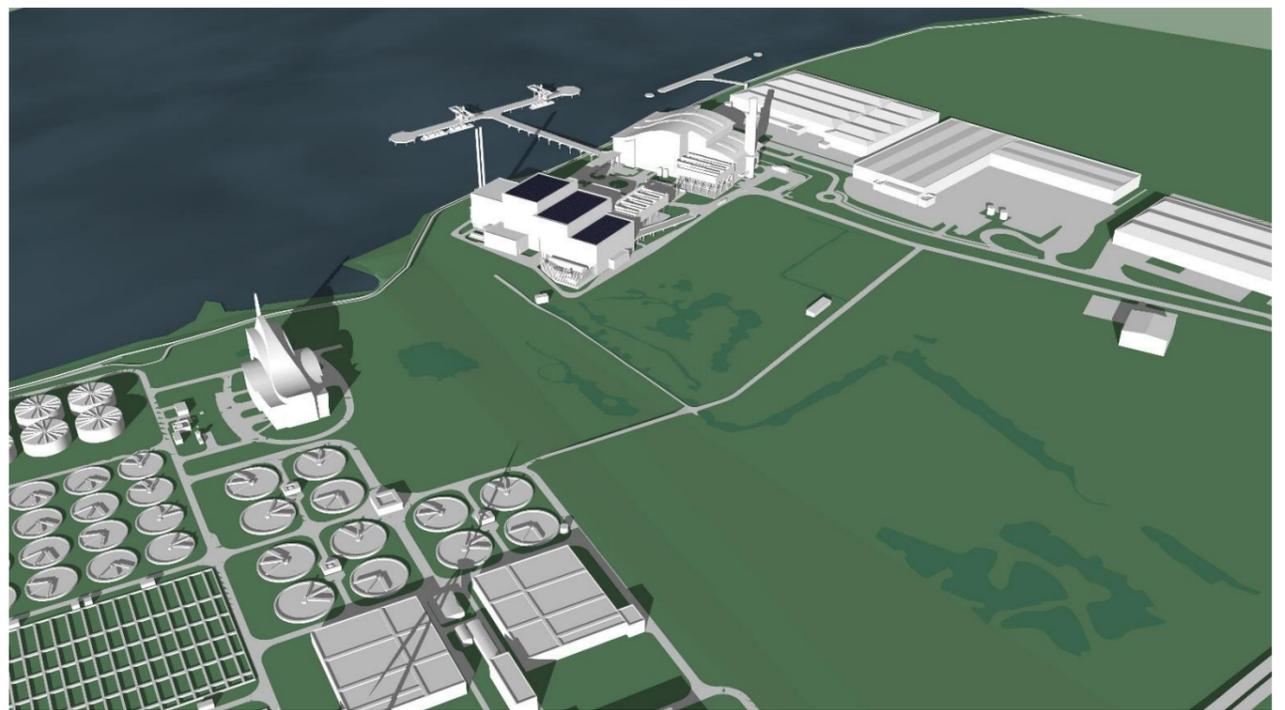
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September 21<sup>st</sup> – 15:00



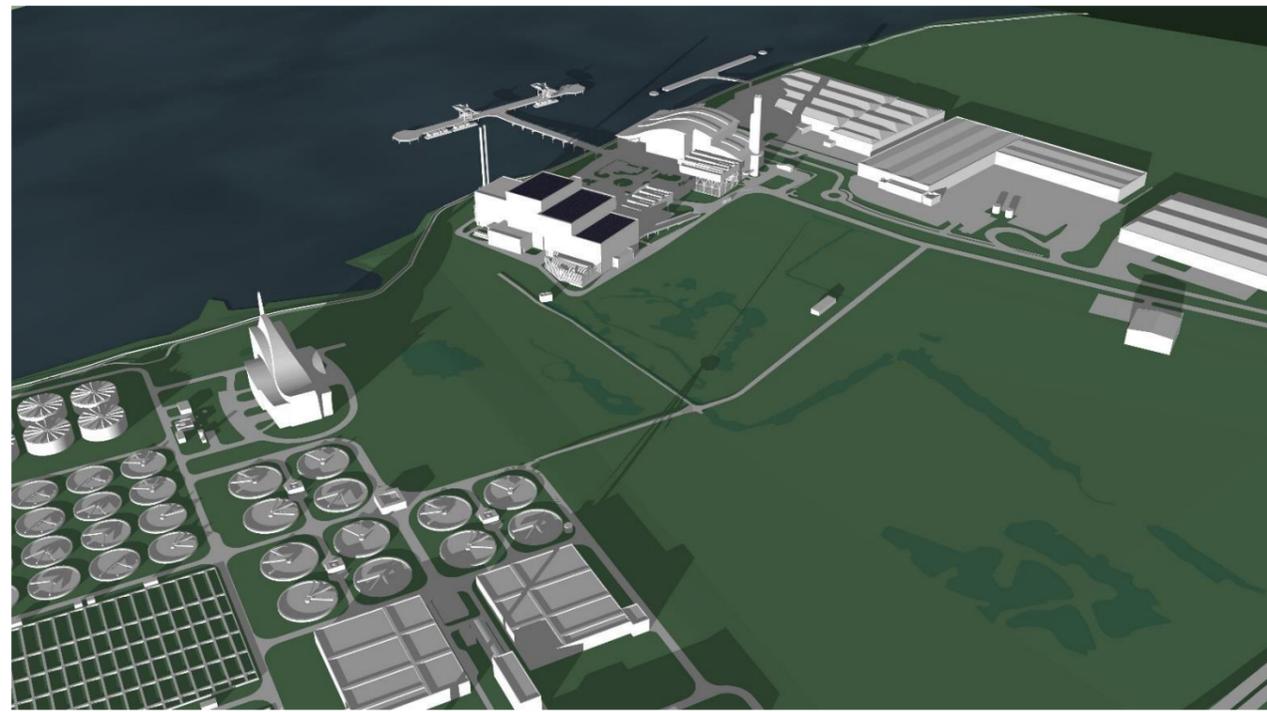
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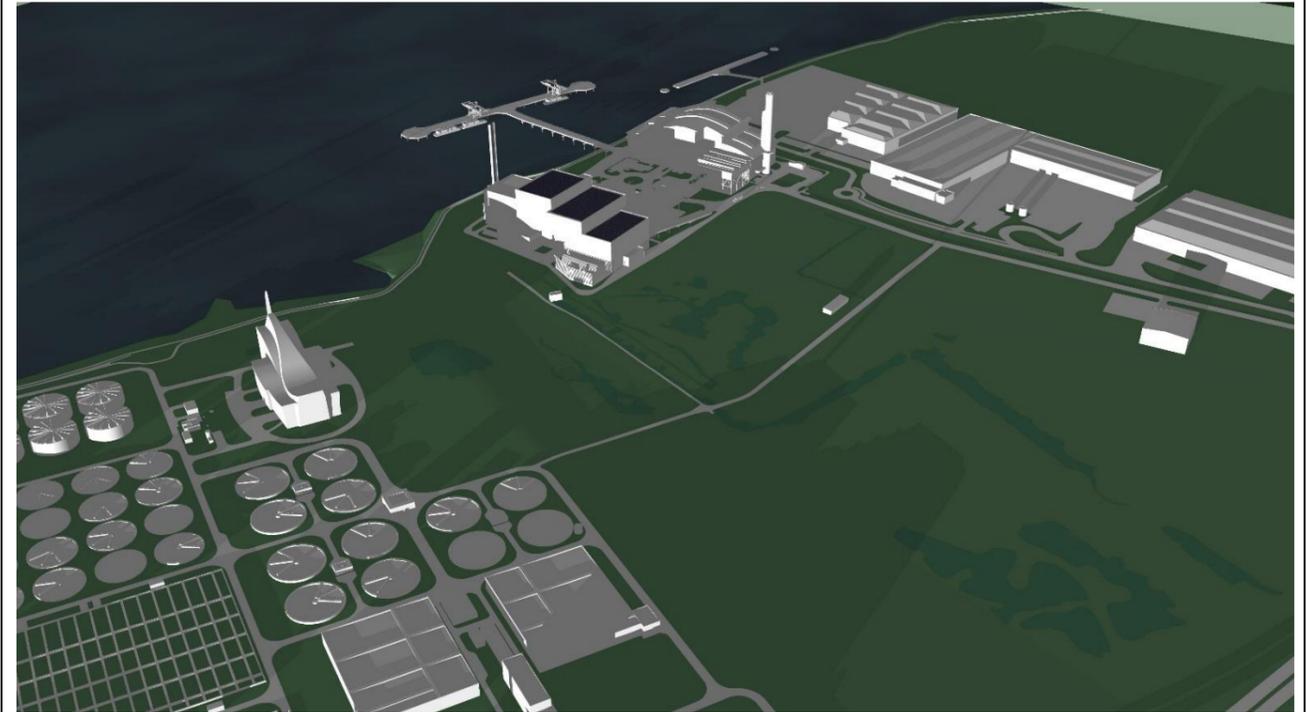
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September



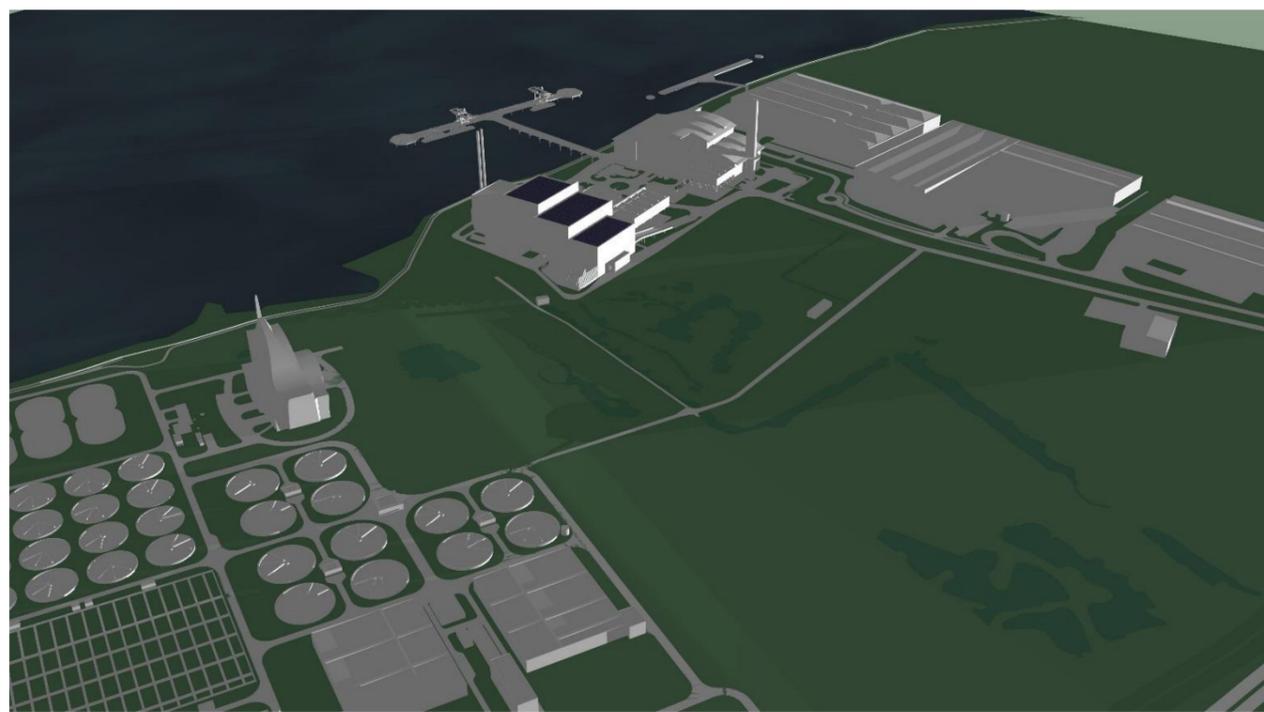
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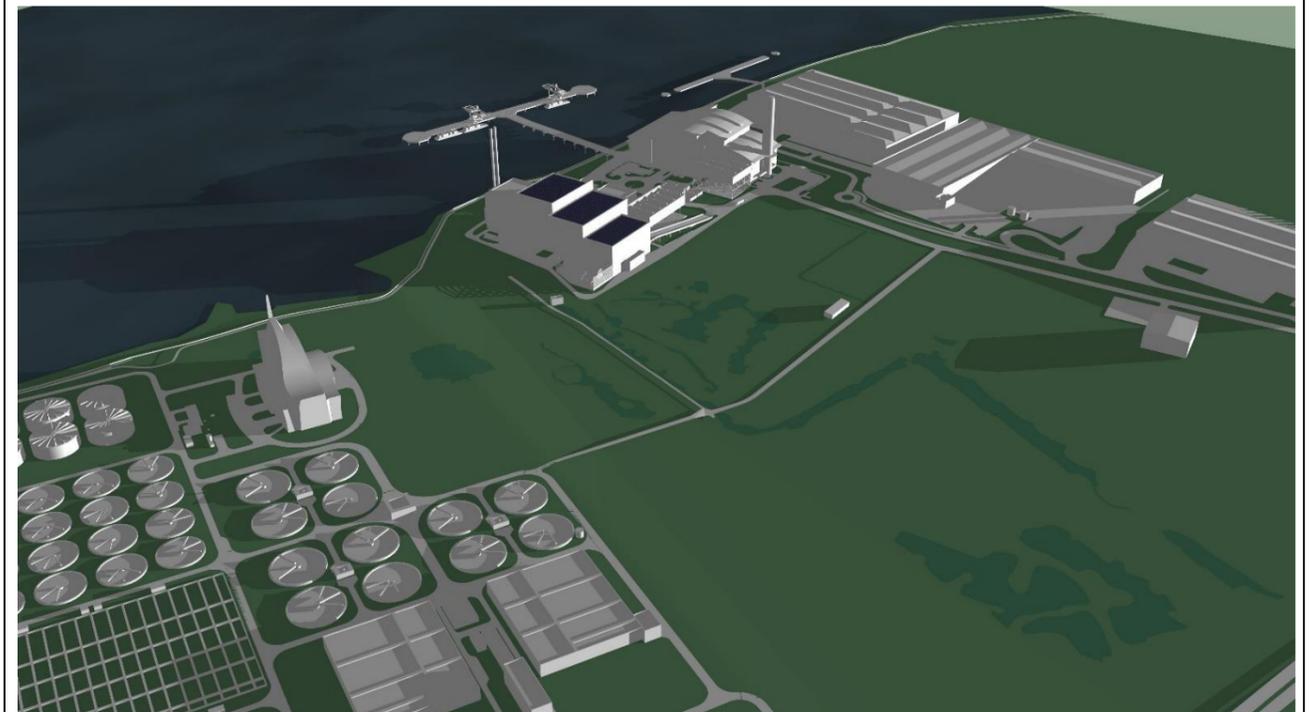
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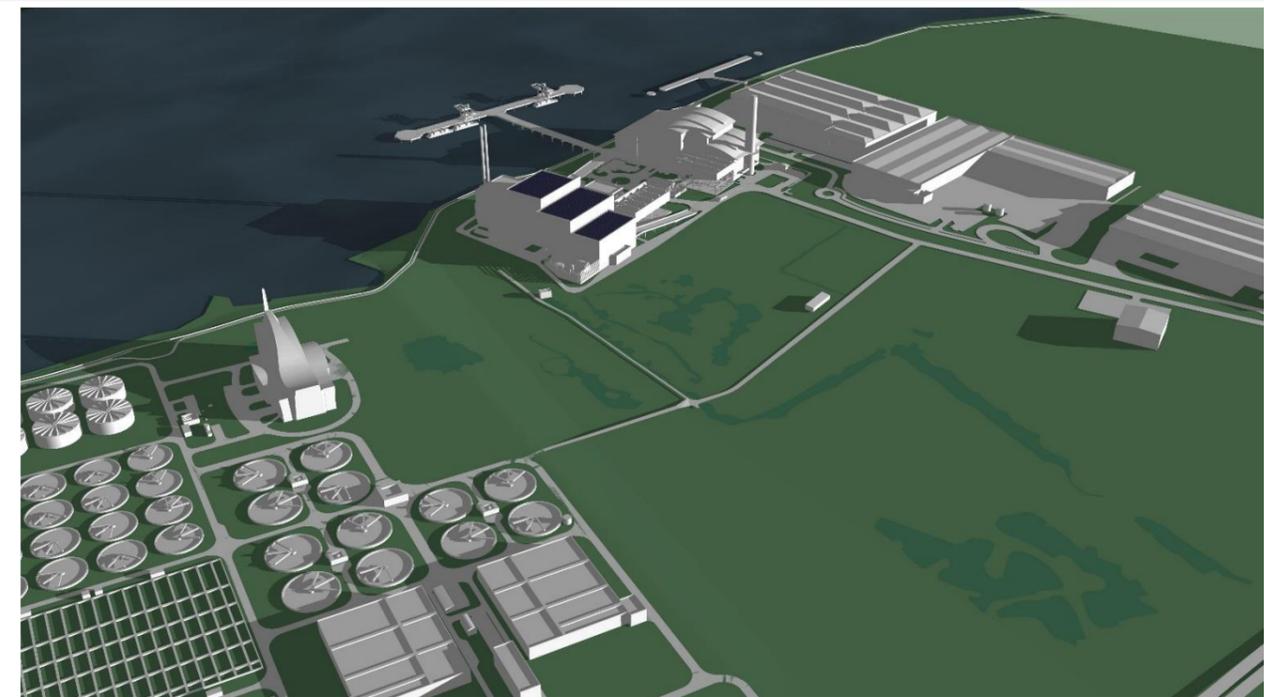
December



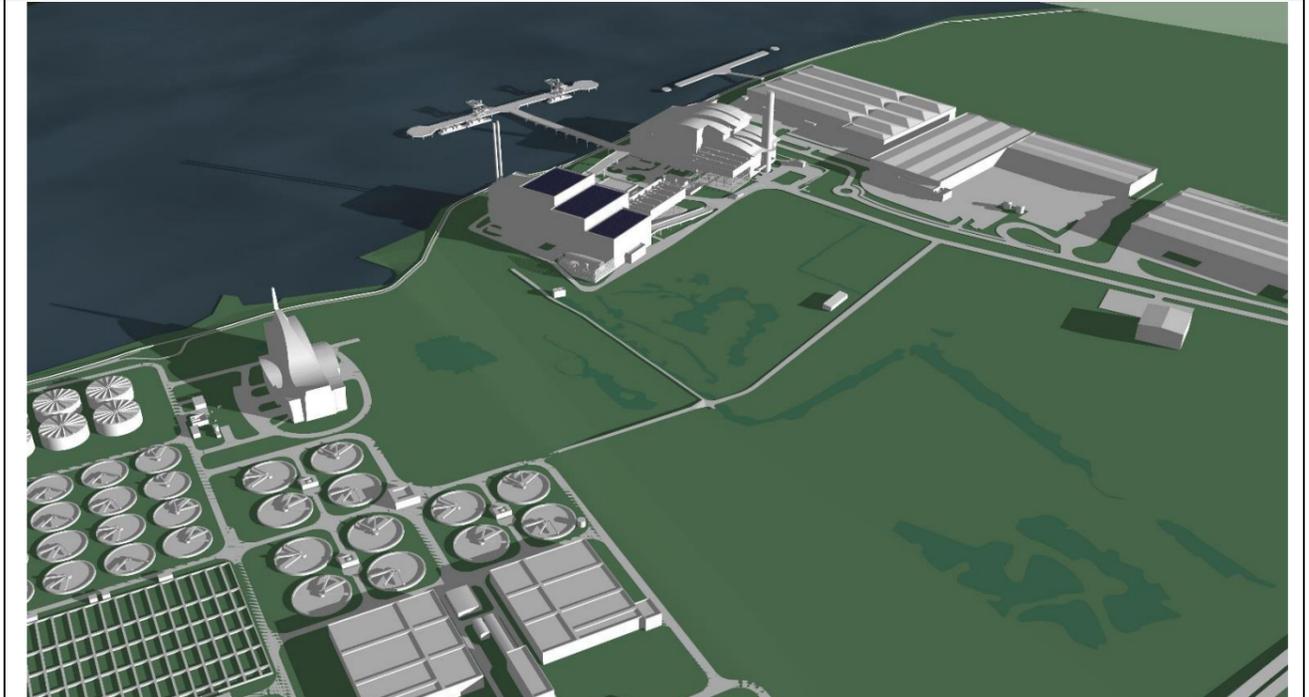
December 21<sup>st</sup> – 08:25



December 21<sup>st</sup> – 09:00



December 21<sup>st</sup> – 10:00



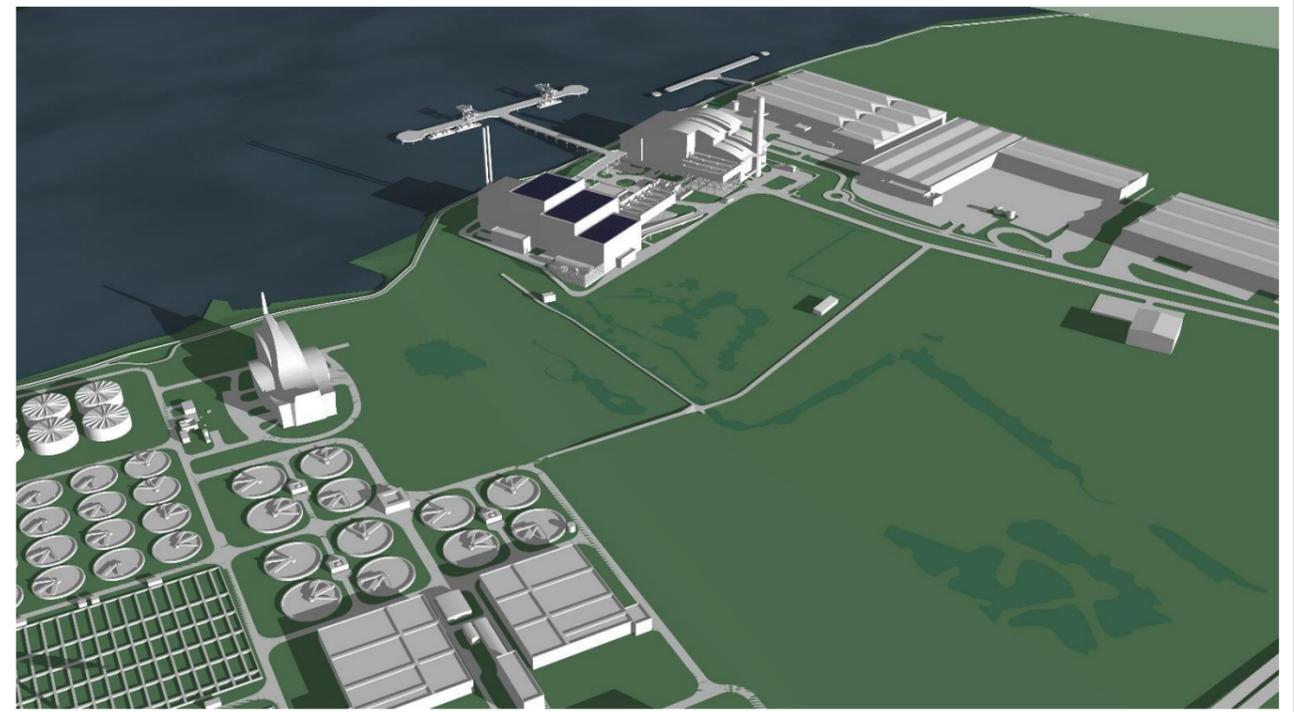
December 21<sup>st</sup> – 11:00

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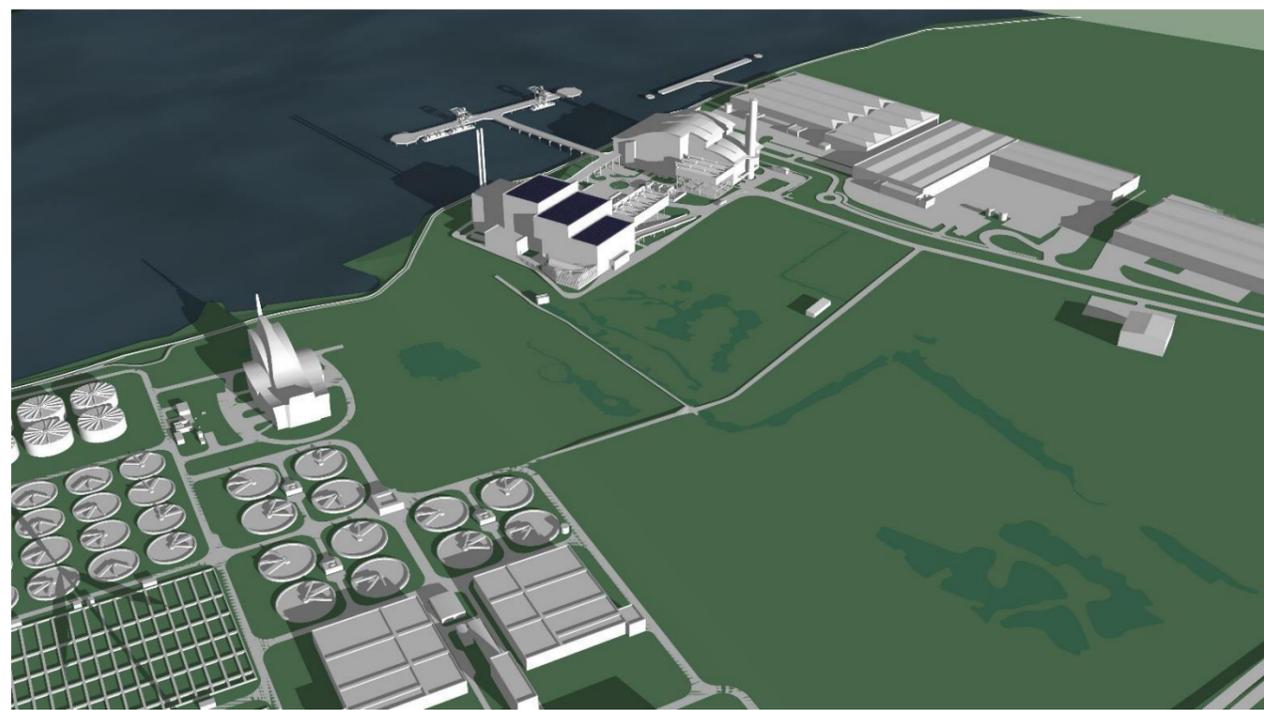
December



December 21<sup>st</sup> – 11:30



December 21<sup>st</sup> – 12:00



December 21<sup>st</sup> – 13:00



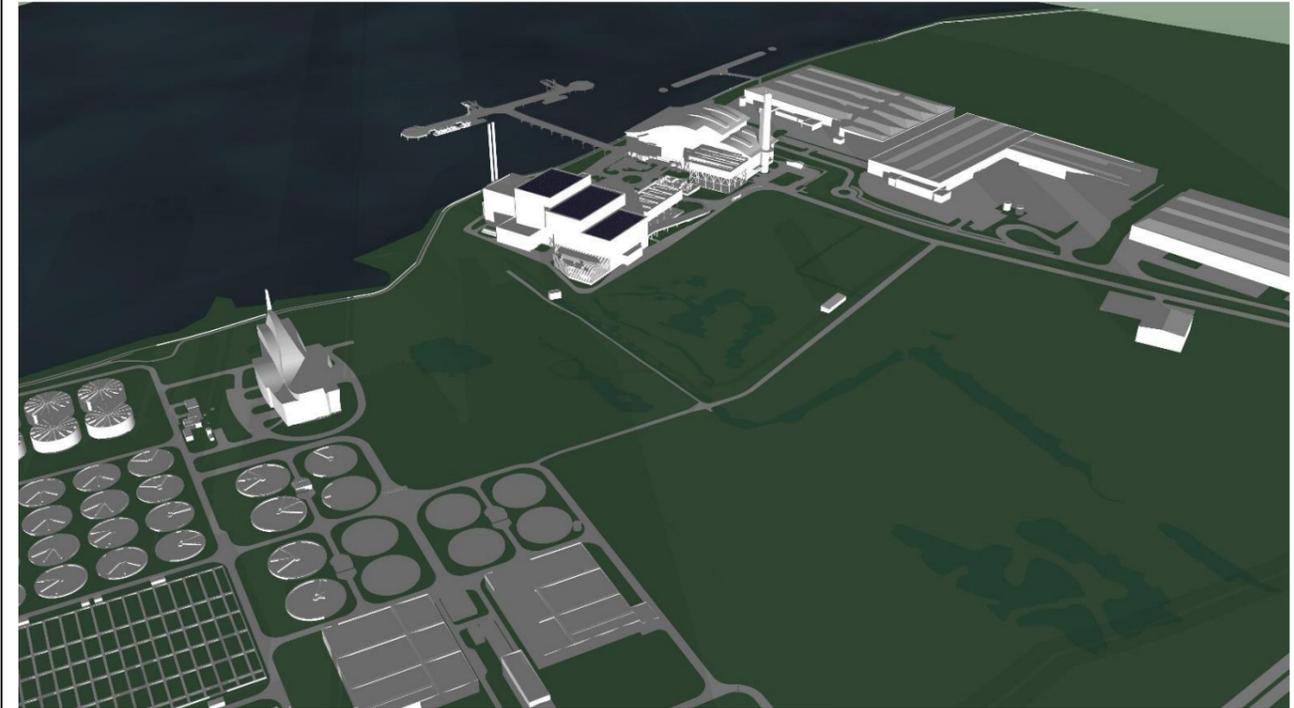
December 21<sup>st</sup> – 14:00

# TECHNICAL NOTE

December



December 21<sup>st</sup> – 15:00



December 21<sup>st</sup> – 15:30