



# **CrayoNano**

# **Q4 2023 Results Presentation**

**15 February 2024**

**Disrupting the fast-growing market for disinfection**



## Presenters today



**Jens Kielland**

**CEO**



**Dr. Michael Peil**

**SEVP & CRO**



# About CrayoNano

- Established 2012 with a global presence, HQ in **Norway** and operations in **Taiwan**
- Innovative, patented **nanowire technology** positively impacting semiconductor manufacturing - initially applied to disrupt performance for **UV-C LED**
- **Strong technology IP** portfolio with 280+patents (73 core patents across 10 families)
- First product line of **radically efficient UV-C LEDs** are vital components for the **fast-growing** disinfection markets
- Significant **cost advantage** enabling the use of UV-C LED in multiple **applications** across **water, air and surface disinfection**
- **First volume product sales generated, and extensive sales pipeline of customers** across APAC, EMEA and AMERICAS
- Massive **global target market water disinfection** (\$30billion <sup>1</sup>), with UV-C LED being the fastest growing technology therein and ESG driven (\$457million / CAGR 42% <sup>2</sup>)

Note: <sup>1</sup> Knowledge Sourcing; Management estimate, <sup>2</sup> Source: Yole Development Report (2021)

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# CrayoNano pioneers leading UV-C LED solutions



## Patented, cutting-edge UV-C technology and roadmap

- Addressing the industry's key challenges: performance, energy efficiency, and crucially, production cost
- Demonstrates high yield, solving critical industry issues



## Exclusive focus on UV-C LED market

- Asian giants prioritising micro-LED market
- Potential impact on filling existing fab capacity of major Asian players



## Fab-lite supply chain

- Flexible and resilient
- Mitigates geopolitical risks
- Aligns with EU Chips Act objectives to reduce dependence on APAC (and US) for semiconductor production



## Quality-centric approach



## Geopolitical significance as a European entity

### Selected CrayoLED™ H-series feedback

"CrayoLED™ initial testing results are **impressive**. Power and Voltage are matching the specs. 3<sup>rd</sup> party qualification highly appreciated" – US customer (Tier-1 water disinfection)

"H-series is a **highly robust and reliable** UV-C LED with solid package." – APAC customer (Tier-1 system integrator)

"Your **technical specification** in small, standardised form-factor and long life-time is already **taking UV-C LEDs one step further beyond your competitors**" – EU Customer (Tier-1 OEM customer)





# 2023 and Q4 Highlights

## A year of market entry and penetration, with considerable commercial progress

- 5 commercial frame contracts signed with leading global companies
- 12 strategic sales channel partner contracts signed with distributors, design-in representatives, and design-in partners across APAC, AMERICAS and EMEA
- First volume product sales generated, with NOK ~1 million in sales revenue received in 2023, and NOK 13 million already contracted to be delivered in 2024
- Global sales pipeline strongly scaled and progressed
- +1,200 sales leads and +150 opportunities sourced, with ongoing design-in activities (7 already won in 2023)
- Enhanced and scaled operations in Taiwan, with a strong local leadership team
- Successfully raised gross proceeds of NOK 125 million in new capital to support accelerating growth plans, including €5 million from the European Innovation Council
- Good progress in the UV-C LED product development, showing improvements in power performance and cost reduction

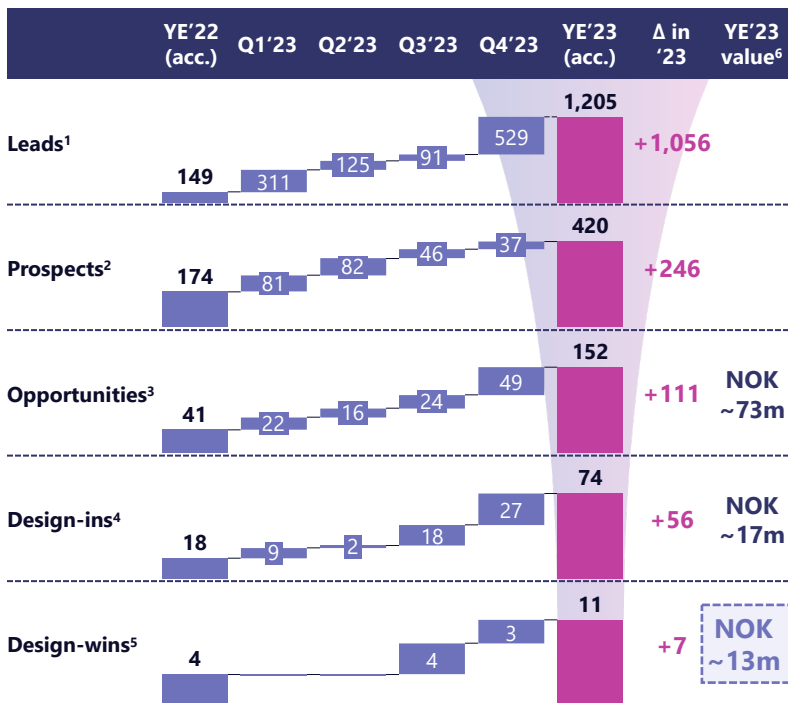


# Customers and Sales



# Several contracts already signed and expanding pipeline

Significant growth in interest from customers during 2023; Leads +~700% and Design-ins +~300%



Note: KPIs on a per project basis

## Most recent contract wins

Company	Date	Contract type	Potential contract size <sup>7</sup>
Unice Co., Ltd	14 Nov '23	Frame contract	NOK 2m ++
MADRIXKOREA	8 Nov '23	Frame contract	NOK 2m ++
MOUSER ELECTRONICS	1 Nov '23	Distribution agreement	
PERSCOM	31 Oct '23	Frame contract	NOK 2m ++
IRTRONIX	23 Oct '23	Distribution agreement	
AUDAX ELECTRONICS	6 Oct '23	Design-win	
DUVROO	29 Sep '23	Design-win	
DUVROO	8 Sep '23	Frame contract	NOK 2m ++
AquiSense Technologies	4 Aug '23	Frame contract	NOK 4m ++

**NOK 13m of sales already contracted to be delivered in 2024**

Note: <sup>1</sup> Companies with "an interest in CrayoNano"; <sup>2</sup> Qualified leads with potential to become customers or opportunities; <sup>3</sup> Prospects who have potential quantifiable business; <sup>4</sup> Customers who are engineering, qualifying and performing next steps to incorporate CrayoNano into their product(s); <sup>5</sup> CrayoNano customer with volumes; <sup>6</sup> Weighted pipeline portion within 2024; <sup>7</sup> Over 12 months



# Lower price points enable new applications for UV-C LED

~20%<sup>1</sup>  
Share of market '26E

## Main current UV-C applications



Water treatment



Drinking water disinfection



Air purification systems



Aquarium sterilizers



Laboratories & hospital disinfection



Food packaging disinfection

~80%<sup>1</sup>  
Share of market '26E

## New UV-C LED applications



POU: Faucets, showers & POE



Consumer white goods



Water coolers, ice makers



Food processing sterilization



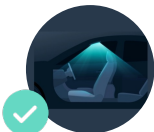
Cleaning drones & robots



Baby bottles sterilizers



Air conditioner



Automotive



Dishwasher



Public transportation



Healthcare/medical



Humidifiers

✓ Currently in active dialogues or design-in processes

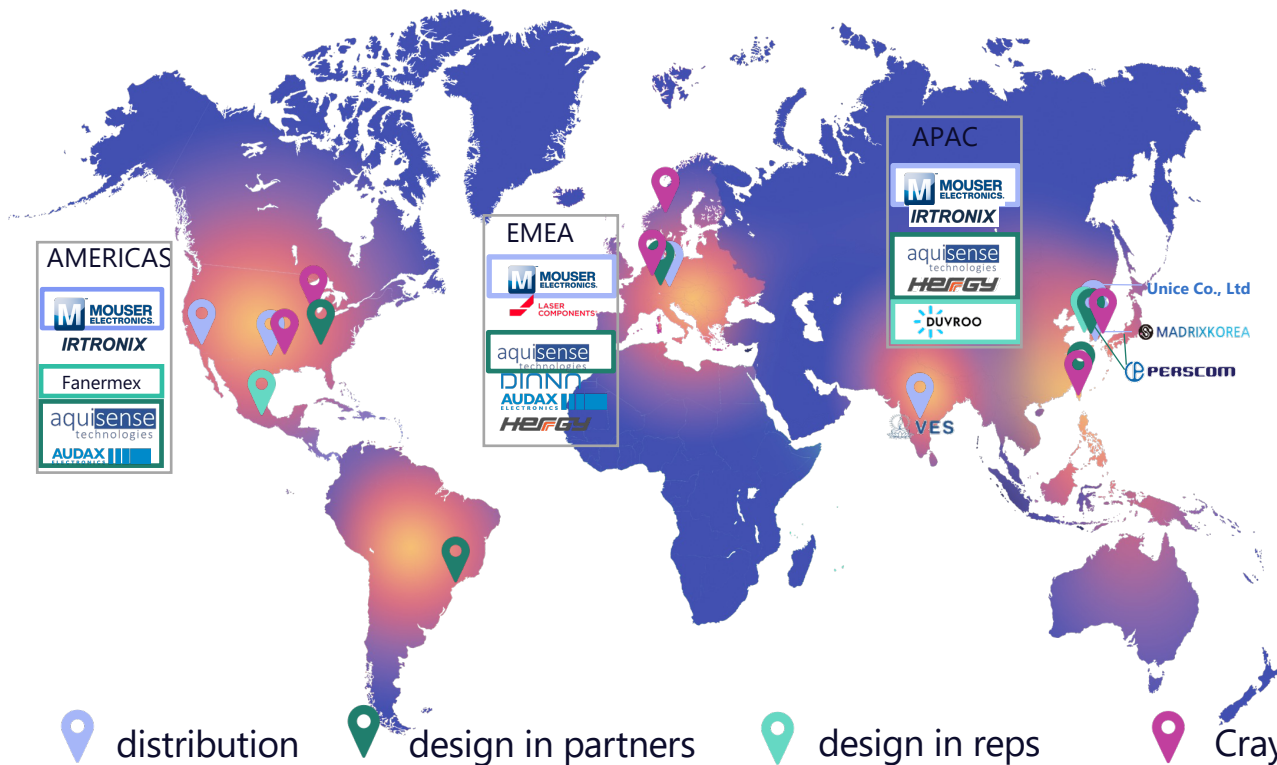
*Design-in with Tier 1 supplier to major global OEM for white goods (incl. washing machine and dryer)*

**Additional design-ins in progress with blue-chip brands.**

Note: <sup>1</sup> Management estimates: ~20% replacement of current lamp business, and ~80% new applications | Source: Yole Development Report (2021, 2020); POU = Point of Use; POE = Point of Entry



# Sales and sales channel partner network established in 2023



Partner	HQ location*
Mouser Electronics, Inc	USA
IRTronix	USA
Fanermex	Mexico
AquiSense Technologies	USA
Audax Electronics	Brazil
DIANA Electronic-Systems	Germany
Laser Components GmbH	Germany
Hergy	Taiwan
DUVroo Inc	Korea
Unice Co.	Korea
Madrix Korea	Korea
Perscom	Korea
Vallalar Energy Solutions	India

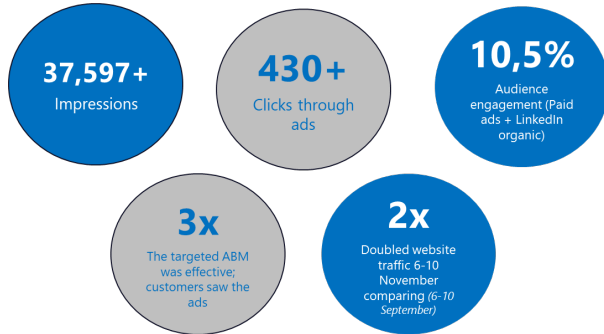
\* Markers show the locations of our partners' HQs and our sales team  
Partners with selected country responsibility are listed next to the specific country. Partners with broader economic area responsibility are listed under the areas.



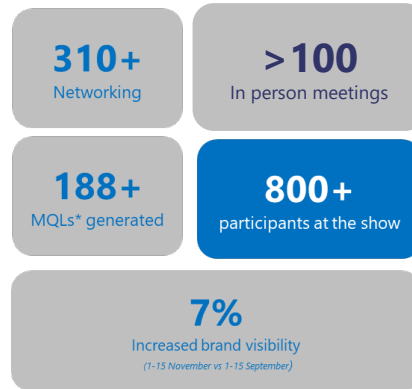
# CrayoNano visibility in market: 1<sup>st</sup> exhibition, a success!



### Targeted digital marketing campaign

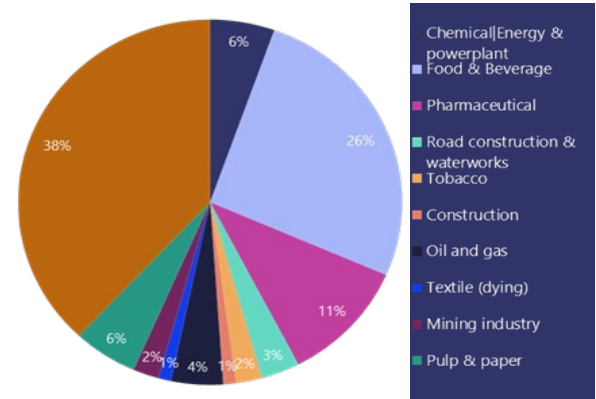


### Highlights



### Building high quality leads

Visitor demographics





# Learning from large number of opportunities and design-ins

Insights from design-in activity develop **Product roadmap & Product portfolio** to key market segments focussing on

- (1) Existing product
- (2) New UV-C LED chip product with significant cost advantage
- (3) Customisation for large OEM customers

**(I) Modules** are LED assemblies with simple functions for efficient integration into systems. For example, LED groups with electrical and optical elements – similar to a light fixture

**(II) Systems** are LED module with peripherals for operation and further functionalities and are integrated into machines and other products that do a job. They can be non-self-containing or plug-and-play.







# Ongoing projects with blue-chip clients

## Drinking water dispensers



### Partner A

- Engaged in design activities with CrayoNano for home appliance water reactors and dispensers
- Showcases interest in integrating advanced disinfection solutions into their product lineup

## Washers & dryers



### Partner B

- Collaborating with CrayoNano for washing machines and dryers, targeting odour prevention through water disinfection
- Initial shipment of >1kpcs for serial production, focusing on enhanced hygiene in laundry appliances

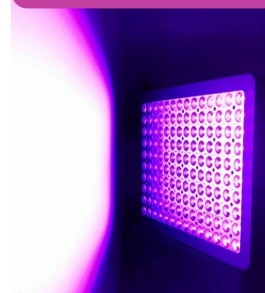
## Coffee machines



### Partner C

- Partnering with CrayoNano to integrate UV-C LED disinfection tech into coffee machines, enhancing taste and hygiene
- Aims to revolutionise coffee machine sanitisation, leveraging CrayoNano's innovative technology

## Hard coating curing



### Partner E

- Partnering with CrayoNano for UV-C curing in furniture production, aiming for cost reduction and increased durability
- Reflects focus on sustainable practices and innovative manufacturing techniques





# Product Development and R&D



# Developing the product portfolio

## 3 Major Drivers

### Growth of sales and market penetration with H-series

Improvements of competitiveness focusing on pricing and performance within the 100 mW power class

### Specific customised OEM products to grow into attractive new niches

Opportunities in the pipeline have shown the market can grow into new attractive niches, with specific optimized products. In 2023, implemented required engineering capacities and skills

### Growing total addressable market by driving down costs of the UV-C LED technology

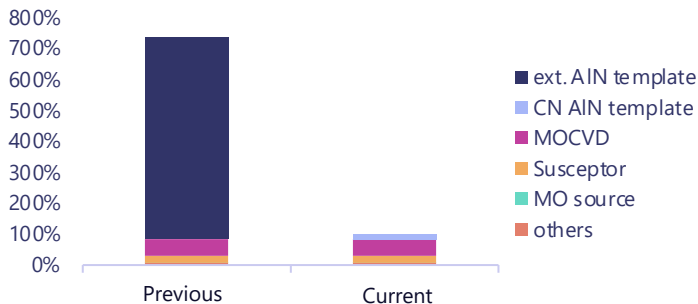
Targeting to implement significant step forward to market leading position by reducing the price-performance parameter by 50% by end of 2024



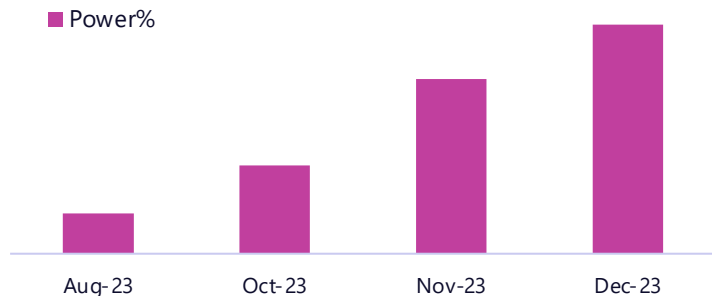


# Technology development focused on significant reduction in price-performance

## EPI-wafer cost structure (estimate at scale)



## Chip power improvement in H2-23



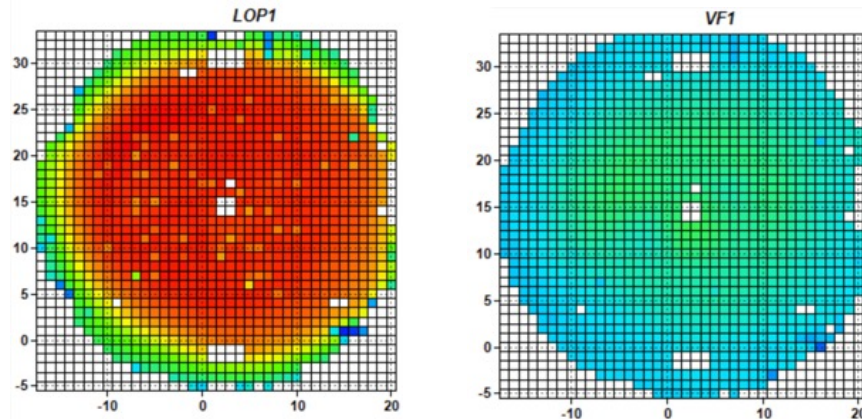
- Strong acceleration in technology development following pivot and scaling in Taiwan
  - 86 average monthly # runs in H2-23
  - Leveraging network with 3 chip processing foundries to accelerate development
- Technology development takes place in high-volume foundry in Taiwan
  - Access to high-volume manufacturing
- Successful development of internal wafer template leading to significant reduction in EPI-wafer cost
- Substantial improvement in relative chip power during Q4-23. Further improvement needed for outperforming device





# Industrialization steps remaining before product release

- Our development process is based on established industrialization processes within semiconductors and LEDs
- Focus is on further power improvement and yield improvement, operational voltage is good
- Wafers show edge defects that needs to be optimized to increase yield. Improvement of leakage current and wavelength uniformity also required before release to manufacturing
- Target to launch UV-C LED with 50% reduction in price-performance parameter in Q4-24



Wafer maps, each square is representative for a chip and the colour shows the performance. Showing results per end Q4 following technical development.



# Q4 Financial Update



# Q4 2023 Financial Summary

## Profit and loss

NOK millions

	Q4-23	Q4-22	FY23	FY22
Sales revenue	0.4	0.2	0.9	0.4
Other revenue	0.2	0.2	3.3	7.6
<b>Revenue</b>	<b>0.6</b>	<b>0.4</b>	<b>4.2</b>	<b>8.0</b>
COGS	0.6	0.1	0.9	0.2
Payroll and related costs	8.2	6.4	38.8	35.0
Other operating costs	4.4	16.0	30.1	41.4
<b>EBITDA</b>	<b>-12.5</b>	<b>-22.1</b>	<b>-65.6</b>	<b>-68.6</b>
Depreciation & amortization	1.7	2.1	8.0	7.3
Write-down & loss fixed asset	5.0	-	5.0	-
<b>EBIT</b>	<b>-19.2</b>	<b>-24.2</b>	<b>-78.6</b>	<b>-75.9</b>
Net financial items	-0.3	0.1	-1.6	-0.6
<b>Net profit before tax</b>	<b>-19.5</b>	<b>-24.1</b>	<b>-80.2</b>	<b>-76.5</b>

## Comments

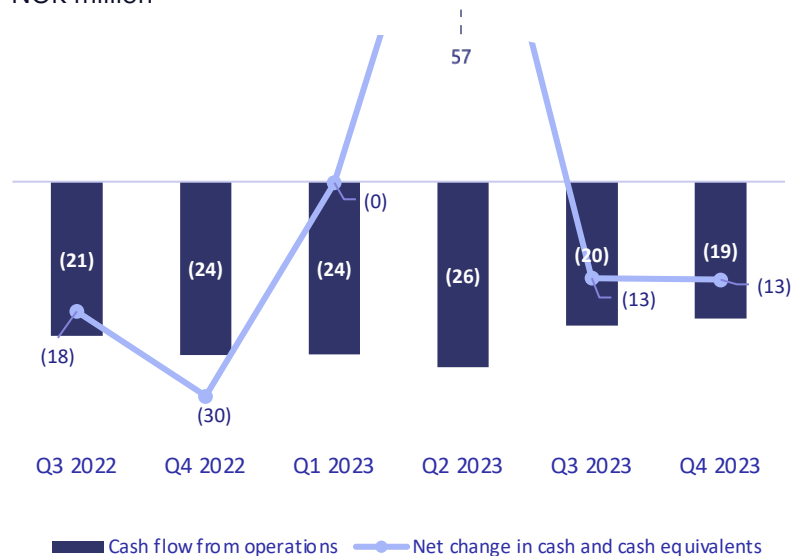
- Sales revenue of NOK 0.4m in the quarter from sample shipments
- Total operating cost at NOK 12.6m, a decrease of NOK 5.4m (43%) compared to previous quarter, and NOK 9.8 (78%) below the same quarter last year
- EBITDA of NOK -12.5m, an improvement of NOK 4.9m against previous quarter and NOK 9.6m against last year
- Revenue of minimum NOK 13m already contracted to be delivered in 2024



# Q4 2023 Cash flow

## Quarterly cash flow development

NOK million



## Comments

- Cash flow from operations ended NOK -19m in Q4-23, slightly improved quarter-on-quarter
- Net cash down NOK 13.6m quarter-on-quarter, in line with previous quarter, as negative cash from operations is partly offset by sale of assets and working capital financing
- Cash balance at end Q4-23 of NOK 40.2m and NOK 0.3m available credit facility



# 2024 Focuses





# 2024 Focuses



**Revenue growth with strategic partner network**



**Enable scaling effects through our Fab-lite supply chain**



**Opening up new growth markets by technology and price-performance lead**

**Secure long-term capital to achieve these aims before moving to a cash flow positive position**



# Closing remarks

## Commercial progress

- Considerable commercial progress, frame and sales channel partner contracts signed, and first volume product sales

## Established operations in Taiwan

- Strong local leadership team established in Taiwan

## Technology development and product roadmap

- Increasing the addressable application markets and CrayoNano's market position and competitiveness



# Appendix



# CrayoLED™ contributes to making clean drinking water available for the world's population

## Affordable water disinfection using UV-C LED



~1/3<sup>rd</sup>

of CrayoNano's 2024 target customers are in the water treatment and disinfection segment

- Globally, there are more than 785 million people who lack access to clean drinking water
- UV-C LED equipped on the water tap can sterilise water cost-effectively to improve the safety of drinking water
- UV-C LEDs are significantly smaller than their standard UV counterparts, enabling integration in small appliances
- Instant on/off function and limited heat generation make UV-C LED ideal for disinfecting water, incl. cold water



## UV-C LED can replace and complement current methods



### Lower price

Compact, cost-effective alternative to larger UV systems



### Lower power consumption

~70% energy savings compared to mercury UV lamps



### Lower CO<sub>2</sub> footprint

~50% lower CO<sub>2</sub> footprint than mercury UV lamps



### No ozone generation

UV lamps produce ozone



### Less waste

>10 years lifespan versus 1-2 years for UV lamps



### No mercury and no need for toxic chemicals

Conventional UV lamps contain mercury and chlorine commonly used in water treatment systems



### Carefree technology

Safe, environmental-friendly, and energy efficient

**CrayoLED™ is a sustainable alternative to mercury UV lamps, and contributes to a healthier and safer everyday life**

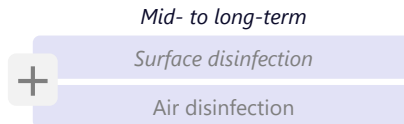


# Massive global target market:

UV-C LED to be the fastest growing technology

**Focus near-term**  
**USD ~30bn**

Global water disinfection market (2023e<sup>1</sup>)




Global water disinfection market, near-term split by technology<sup>1</sup>



**1** UV-C technology can both **complement existing technologies** and solutions and **fully replace current methods**

**2** **Capabilities and continuous improvement** of UV-C LED technology expected to open **new water-treatment applications, expanding TAM**



 **42%**  
UV-C LED water disinfection market, CAGR '21-'26<sup>2</sup>

Note: <sup>1</sup> Knowledge Sourcing; Management estimate; <sup>2</sup> Yole Development Report (2021)



# Profit and loss

(unaudited)

## Condensed profit and loss statement

(Figures in NOK thousands)

	Q4 2023	Q4 2022	FY 2023	FY 2022
Sales revenue	378	230	923	438
Other revenue and public grants	240	211	3 314	7 559
<b>Total revenues</b>	<b>618</b>	<b>441</b>	<b>4 237</b>	<b>7 997</b>
Cost of goods sold	553	133	876	236
Payroll and related costs	8 189	6 412	38 832	34 993
Other operating costs	4 423	15 982	30 144	41 378
<b>EBITDA</b>	<b>-12 547</b>	<b>-22 086</b>	<b>-65 615</b>	<b>-68 611</b>
Depreciation	1 725	2 110	8 015	7 253
<b>EBIT</b>	<b>-19 248</b>	<b>-24 196</b>	<b>-78 606</b>	<b>-75 863</b>
Net financial items	- 294	52	- 1 642	- 633
<b>Net profit before tax</b>	<b>-19 543</b>	<b>-24 144</b>	<b>-80 249</b>	<b>-76 497</b>
Tax expense	12 613	-5 254	0	-17 145
<b>Net profit (loss)</b>	<b>-32 156</b>	<b>-18 890</b>	<b>-80 249</b>	<b>-59 351</b>
# shares in 1000	37 524	28 401	37 524	28 401
Earnings pr share (NOK)	-0.86	-0.67	-2.14	-2.09

Note: P&L presented is net of capitalized R&D



# Balance sheet

(unaudited)

## Condensed balance sheet

(Figures in NOK thousands)

	FY2023	FY2022
	31/12/2023	31/12/2022
<b>Assets</b>		
Development, patents and licenses	69 344	66 129
Deferred tax assets	43 054	43 054
Tangible fixed assets	2 409	12 735
Financial fixed assets	1 059	1 059
<b>Total non-current assets</b>	<b>115 867</b>	<b>112 977</b>
<b>Current assets</b>		
Inventory	13 708	2 087
Trade and other receivables	6 446	16 896
Cash and cash equivalents	40 197	10 238
<b>Total current assets</b>	<b>60 351</b>	<b>29 221</b>
<b>Total assets</b>	<b>176 218</b>	<b>152 199</b>
<b>Equity and liabilities</b>		
<b>Equity</b>		
Share capital	750	568
Share premium account	233 326	105 786
Additional paid-in capital	3 688	2 596
Other equity	-15 129	0
Retained earnings	-80 248	0
<b>Total equity</b>	<b>142 387</b>	<b>108 950</b>
<b>Liabilities</b>		
Convertible loans	0	0
Liabilities to finance institutions	16 289	8 073
Trade payables	4 046	9 239
Government charges	1 188	2 277
Other liabilities	12 308	23 659
<b>Total liabilities</b>	<b>33 831</b>	<b>43 249</b>
<b>Total equity and liabilities</b>	<b>176 218</b>	<b>152 199</b>

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Disrupting the fast  
growing markets for  
disinfection



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