



August 22<sup>nd</sup>, 2019

## Response to statements and claims from Planning Board hearing

We are taking the opportunity to address relevant public comments, also some not related to technical ability issue to provide the public with useful information. Many statements made where either irrelevant, speculative, misleading, or they exacerbated risks.

### 1. Macro picture for salmon industry remains strong

Salmon producers have consistently delivered high margins in the past years. With scaled-up land-based producers arriving in a competitive production cost range, the same profitability potential is present for land-based farms. With continued strong demand growth internationally, the long-term macro-picture remains attractive for the industry. To the left is an excerpt from the latest Pareto Securities report in August 2019 on the international salmon market. Pareto is one of the premier analytical resources on the international salmon market.

While salmon prices are subject to a volatility in an international commodity market, salmon producers have consistently turned an attractive profit every year. Forward spot pricing is predicted to remain in an attractive and profitable interval. Forward contracts can be used to reduce potential volatility risk when desirable. In conclusion, there is an attractive market for land-based producers located in U.S. territory.

**Pareto**  
Securities AS Equity Research

### Outlook is bright, but pricing is high

*Although we lower our price estimates on slightly higher supply, we continue to be positive to the outlook of the salmon sector and expect prices to remain above NOK 60/kg for several years. However, we start to find valuations demanding and currently rate a few names Hold/Sell. We see LSG and SALMON as the best picks in the sector, but also upgrade SALM to Buy (Hold).*

#### Short term supply increased, but longer term little changed

Based on strong food sales during the summer we have increased our H2 growth in Norway from 3% to 4%. We have made limited changes for the other regions as biology in Chile is developing in line with our expectations. Into 2020/2021 we have made marginal changes and expect limited growth in all regions. However, 2020 growth in Norway will be slightly above normal at 7% YOY, due to the reversed algae effects which especially will lead to strong H2 2020 growth.

#### Long term potential massive, but large volumes still far ahead

We continue to monitor new growth initiatives closely and see increased numbers of new projects both on land, offshore and in new farming regions. We continue to argue that impacts the next 3 years will be limited but see somewhat more potential in our 2025 estimate.

#### Surprisingly strong demand growth in EU, other markets coming too

Demand side is continuing to be strong, with especially the growth in EU surprising on the upside during Q2. Going forward we still stick to our thesis that growth outside EU will be the strongest, and we see several indicators for continued strong demand growth both in US and Asia.

#### H2 19 prices reduced, but prices to stay above NOK 60 for years

Based on the higher volumes we expect for H2 2019 we have lowered our salmon price estimates to NOK 55/60 per kg (prev. 58/62). We have also lowered our EUR 2020/2021 price estimates slightly as we also expect somewhat higher absolute volumes in these years. However, due to the weak NOK we keep the salmon price of NOK 62/63 per kg for 2020/21 unchanged. We are in line with consensus on 2019, but still 5-10% above on 2020/2021 estimates.

## 2. NAF Experience

This topic was addressed comprehensively in the last Planning Board meeting. Currently another company is in the final stages of permitting in Bucksport for a somewhat smaller, but still large facility with no track-record in construction or operating RAS farms. Consistent standards should be applied in permitting. Capabilities and quality of construction partners, not age of a company should guide technical ability assessments.

NAF has documented more experience in designing, constructing, operating, and improving the largest tank systems around than anyone else in the industry. We own the three largest RAS tanks in the world. The starting point for the European operation was a Kruger AS licensed design. We have added vast improvements to these designs and leveraged our experience to move beyond these. The proposed project in Maine is not based on any third-party licensed designs, nor are most other RAS projects in the industry.

Few if any companies in this segment match the experience base NAF has assembled across these disciplines. No other proposed RAS project in Maine can show such experience and capability. NAF is the company in Maine with the longest history in the commercial RAS segment, and the only company leveraging Norwegian industry experience. We are the only RAS grow-out company internationally with 3 commercial scale farms in our portfolio.

We have produced one of the most comprehensive permit application packages internationally for a RAS farm build-out in Maine.

The collective experience and know-how in the company goes far beyond the age of the company as we made clear in the presentation to the Planning board. In addition, the proposed construction will be done by some of the most experienced construction companies in the U.S.

## 3. Scale and scaling

Internationally we are seeing newcomers in the industry with no active projects announcing 5,000, 10,000, and 20,000 metric ton facilities. In our experience, a moderate size farm should always be the first step as there is a learning curve involved and need to build capabilities before scaling up. NAF has done both, and more.

NAF is permitting for long-term expansion in Belfast. We are laying the foundation for growth and expansion over several phases. The proposed scaling is a natural step up for our company. The first construction step in Maine involves construction of 3X our current capacity. This is a moderate expansion rate compared to many other projects. The risk of going from 3,000 to 10,000 metric tons capacity as is representative of our first step in Maine, is much lower than going from zero capacity directly to large scale. When we take on the following expansion phases in Belfast, the relative up-scaling level will be even more moderate. It is relevant to note that we are not building the whole facility in one step.

Comments related to scaling risk:

- Scaling is achieved by replicating independent modular systems over several phases of expansion. Scaling of any business always involves risk, but by standardizing designs and operations as we have done, the risk of scaling is reduced.
- Risk is also diversified and reduced since the modular designs operate as independent systems. If one system for any reason should have complications, it will not impact the other production systems.
- The core technologies for RAS and wastewater treatment are not new. Almost all the core technologies are widely used in the aquaculture industry or other established industries, and in our current operations.

#### 4. InterAqua Advance (IAA) Staff

IAA was one of the early vendors in the RAS industry with several decades of projects behind them with delivery of facilities to the largest seafood producers in the industry. Their design and installation staff were and remain highly respected in the industry. Their RAS systems continue to operate today across the industry. The design team was of no fault when the owner put the company in a bankruptcy position in 2018. Rather they were highly frustrated by the commercial decisions made. When we moved in to hire their senior design staff, our reference checks confirmed high satisfaction with them from respected seafood producers. These persons have been involved with NAF over the past two years. We have since then added additional staff to the team, in addition to the engineering resources we have in Norway and the US. We know of no other RAS company that has a complete internal multi-disciplinary design team with such a track-record of delivering quality facilities. Other companies proposing facilities in Maine have only a fraction of the design and installation experience we hold. That does not discount that they also can deliver good projects.

#### 5. Patents

The issue of patents brought up by interested parties is irrelevant. It was unclear what the purpose of the topic was. Most RAS farms hold no patents, and the proposed NAF project in Belfast does not require any external patent rights.

IAA never had an infringement suit, as claimed. IAA had a dispute in the past that was resolved without further complications or any law suit. It is not uncommon that such issues emerge in various technology industries. Regardless, that history has no relevance to Nordic Aquafarms today, nor to the proposed Belfast project.

References to licensed RAS 2020 Kruger designs that we have used in our first stage build-out in Europe are irrelevant. These were implemented in collaboration with license holder Kruger AS in the Nordic facilities. The RAS2020 design had a range of flaws that our company as the first buyer of these addressed and amended in Denmark, and further improved on in Norway. NAF has moved on with a different design approach and is no longer investing in new RAS 2020

designs. Our tank designs are developed in-house with no relevance to other licenses or patents.

## 6. Insurance

All NAF facilities are fully financed and insured. All other facilities in this segment that we know of are also fully insured. Insurance is obviously a requirement from investors. NAF would not be investing millions of USD in Belfast if there was a risk of not obtaining insurance covers. President Erik Heim has held executive positions in large insurance companies earlier in his career and is well connected in the insurance market. Atlantic Sapphire that is two years ahead of Nordic Aquafarms in the U.S., has full insurance for much larger facility under development.

In the past two years there has been a wave of new land-based facility announcements, many from parties with no prior experience. It is correct that some insurance carriers have pushed back on providing covers given that they perceive many of these newcomers to lack experience. Other carriers may limit their focus to net pen operations, as a larger industry segment.

There are, however, insurance carriers that insure RAS companies with a track-record such as Nordic Aquafarms. Insured facilities is proof of that. As with other experienced producers, we see little risk related to attaining insurance covers in the future given our track-record to date. In our case, we have a clean history with no major incidents, and thus a favorable risk profile.

Willis Tower Watson, a global insurance company, is our broker with deep experience in aquaculture. They have insured our production in Norway. Obtaining covers for the Maine operation will involve risk review sessions and a tender process with our broker and carriers, as with any business. This process will be finalized when permits have been clarified.

Environmental risk in our operation is generally not significant compared to a range of other industries. Gaining appropriate covers is not considered a high risk.

Insurance covers related to construction will be similar as with other process facilities.

## 7. Business disruption risks

General statements were made about human error and failure of systems. Comments need to be more specific to motivate useful answers. The facility design limits external risk related to human error. We do not see how a human error event would have any significant external impacts as there are redundancies in all critical systems, and the farm will be comprised of modular independent systems that encapsulate risk. Human error could cause internal activity disruptions if not mitigated through internal procedures and quality systems. However, we produce fish and do not carry the larger event risks related to some other industries. That includes escape risk - the proposed facility is designed to be escape proof.

#### 8. Operations manual

This would be bioplans, quality systems, and related procedures. These are company intellectual property and is not public material. It would be the same for almost any company. Quality systems and operating procedures are developed by staff with decades of experience in farming salmon, and in operating RAS systems. Relevant points from these are addressed in our various application packages.

#### 9. Yellowtail Kingfish

When NAF invested in Yellowtail Kingfish production, no one had commercial scale experience with the species in RAS. Claims that this is an easy fish are misleading. The brood stock and hatchery activities are much more complex than salmon, while the grow-out phase can be easier with the proper experience. The total infrastructure required to farm this fish is, however, to a large extent the same as for salmon. Thus, facility experience related to kingfish production has a high relevance to salmon RAS operations. As for salmon, we have staff with decades of salmon experience. Our salmon production in Norway is proceeding with very low mortality levels and strong fish growth performance.

#### 10. Bioreactors/MBBR

Our design team has designed and installed bioreactors/MBBR for many years with excellent performance. The technology is running in many RAS facilities today.

#### 11. Best available technology on discharge

Our discharge standard exceeds or meets all Maine DEP standards. Discharge consideration is the subject of the MEPDES application.

When compared to other large-scale operations, NAF is "best in class" on discharge treatment. The highly regarded CLF, GRMI and the Atlantic Salmon Federation have written recommendations supporting our discharge treatment after independent reviews (found on the Belfast city web page). Our treatment standards can be compared with other RAS MEPDES applications in Maine. Many other discharge permits are representative of the normal discharge treatment standards. We believe the whole industry will be pushed towards increased treatment standards as such technology is available. NAF has made a choice to be at the forefront of this development.

The microfiltration NAF is applying among other treatment systems, represents the highest treatment standard in the commercial scale salmon industry by a large margin. No large-scale producers we know of have discharge treatment systems that address potential bacteria and virus risk in the discharge at the level NAF is applying. While the main strategy to manage pathogens is prevention of intake of these into the system, we have still added protection measures for receiving waters beyond what is common in the industry.

Zero-discharge solutions have only been established on small scale, never on large commercial scale. The risks of attempting this on larger scale are significant or require a completely different business model that cannot achieve large-scale fish production today. None of the proposed RAS farms in Maine are based on zero discharge. There are no commercial scale zero discharge RAS farms in Norway or Europe. None of the large-scale producers have zero discharge, and all have a significantly higher discharge of nutrients per pound of fish compared to Nordic Aquafarms. Maine would not achieve any material growth in RAS farms with a zero-discharge requirement.

One approach for zero discharge is aquaponics where plants absorb nutrients. These projects are to a much larger extent vegetable producers, than fish producers. As an example, Superior Fresh in the US produces 100 metric tons of fish, much smaller volumes than large aquaculture producers. The Belfast project would require several hundred acres to pursue such a model. NAF has a centralized nutrient removal approach as most RAS facilities, where nutrients are filtered out and recycled for reuse in the by-products industry.

One existing farm in North-America claiming zero discharge is also only doing 100 metric tons. Scaling such an approach up to large-scale RAS is high risk.

Requiring NAF to go even further beyond the rest of the industry and other projects in Maine on treatment would involve applying vastly different environmental standards to applicants.

Claims that we are discharging “untreated” water are obviously not correct. In fact, none of the external peer reviews done have raised material concerns regarding the impact of our proposed residual nutrient discharge.

## 12. UV treatment systems

The question here relates to a scenario where there are pathogens in the RAS system. Pre-emptive measures keeping pathogens out of the system are the most important. The bay would be the primary source. NAF still employs the highest protection standards for receiving waters in the industry with a multi-stage treatment system for the proposed project.

Ultraviolet light (or UV) is commonly used in aquaculture to neutralize pathogens (bacteria and viruses) that can grow in water. The ability to inactivate bacteria and viruses in water using Ultraviolet (UV) light has been well documented. A large body of research has been published supporting this<sup>1</sup>. As a result, using UV light now an industry standard in aquaculture. Such research has also led to the identification of specific parameters for *how* to best use UV light to sterilize water in fish farms. In some cases, this has even led to minimum thresholds being set by regulatory bodies.

When it comes to treating water with UV, two key parameters are dosage and wavelength. Dosage of UV light is measured in millijoules/square centimeter (denoted mJ/cm<sup>2</sup>), while wavelength is measured in nanometers (denoted nm).

Research has shown that a wavelength of 254 nm is most effective<sup>2</sup>. We have selected equipment designed for 250-255 nm.

In Norway, where recirculating aquaculture systems (RAS) are widely used, a regulatory agency (Norwegian Veterinary Authority) dictates a minimum UV dose of 25 mJ/cm<sup>2</sup>. We have committed to using at least 10 times this dosage for treating our discharge in Belfast, Maine. The use generally neutralizes 99 percent of relevant pathogens. Any bacteria are removed in the prior step of microfiltration, while virus would be neutralized in the UV stage. It's effectiveness is increased when combined with microfiltration.

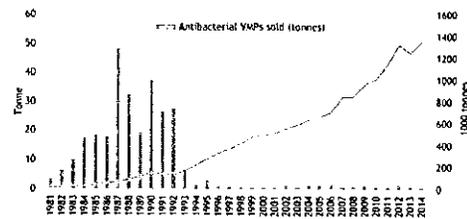
Ozone is also used for water treatment in the proposed facility.

<sup>1</sup>List of scientific publications supporting the effectiveness of UV see page 226-230 of [MEPDES application](#)

<sup>2</sup>Scientific publication indicating 254 nm is the effective wavelength: [Sharrer et al 2005](#)

### 13. Statement regarding RAS as "hot spots" for anti-microbial resistant genes (AMR)

Resistant bacteria could emerge by frequent use of antibiotics. As we have clearly stated, we have never had disease outbreaks requiring use of antibiotics, although disease can occur with any animals. The whole Norwegian salmon industry has dramatically reduced its use of antibiotics over the past two decades. The graph to the right from



NORM/NORM-VET 2016 shows the dramatic decline in antibiotics use (blue columns) in the Norwegian net pen salmon industry, while production volumes (green line) have grown significantly. The related statistics also show that the small use is almost all in open water production, not in RAS smolt farms. Among producers using antibiotics in other parts of the world such as Chile, the risk of resistant bacteria could be higher.

With reference to the same *Norwegian Veterinary Institute Report 2016: Use of antibiotics in Aquaculture* the following summary can be highlighted:

*The consumption of antimicrobials in Norwegian aquaculture implies a very low probability of any development of antimicrobial resistance in farmed fish and transmission of such resistance to humans. Consequently, intake of farmed fish cultivated in Norway pose a negligible risk to human health in terms of antimicrobial resistance. Due to the low sales, it is unlikely that any new antibacterial veterinary medical products will be marketed for farmed fish in Norway in a foreseeable future.*

NAF's most important strategy is prevention of disease intake into our systems as we clearly have a strong self-interest in preventing disease. Bioplans are implemented to mitigate such risk

and promote fish welfare. The primary source of pathogens would be the bay. RAS provides unique opportunities to significantly reduce disease risk. Extensive bio-security and quarantine measures are in place in the proposed facility. Therefore, antibiotics would only be used in rare contingency cases or never. Without material use of antibiotics or other substances in the tanks that could conceivably cause resistance, we find the risk of creating "hot spots" of resistant pathogens in the system significantly mitigated.

We also find it unlikely there is a problem with resistant bacteria from other aquaculture activities in the area, as there is no significant other production using antibiotics. Theories that bacteria would naturally mutate to resistant bacteria in the RAS system have not been observed in any RAS facilities we are familiar with. It should be noted that there is continuous international research working to improve many aspects of bio-security in aquaculture, as global food supply is dependent on this industry.

#### 14. Back-up systems

As we have stated before, the proposed facility can run for weeks off the grid with its back-up systems. There are also built-in redundancies through-out the farm. We have an obvious self-interest in protecting our fish from external events and are experienced with winter conditions as a Scandinavian company.

#### 15. IT systems

All modern aquaculture operations use various IT systems. Our farms use advanced scada control systems and other support systems as all land-based farms do. This is nothing new and a range of such software is available in the global aquaculture market.

#### 16. Discharge as a bio-attractor

Impacts on receiving water is a MEPDES application issue. The issue has been addressed numerous times before by experts at UMaine and has no relevance to our technical ability.

Endocrinologist experts we have consulted in Maine, and who also spoke at one of our public meetings in Belfast, stated that there is no established scientific basis for claiming that our residual discharge is a threat to local lobster populations. This can be confirmed again by other expert interveners in the DEP process. In fact, lobster traps are seen all around salmon net pens in Down-East Maine, operations that have 100% discharge.

As we have also stated, claims that the discharge will attract sea lice and create sea lice problems are also without foundation. Sea lice need high densities of host fish to multiply to any substantial level. With net pen operations there has been a potential issue in some locations with high concentrations of fish in the ocean. The proposed Belfast facility takes the hosts out of the ocean, and our treatment systems block out parasites. There are not any other high concentrations of hosts in the bay to provide a basis for material growth in sea lice populations.

In conclusion, Maine already has a well-developed aquaculture sector with a significant pipeline of new proposed projects. Maine authorities are experienced in permitting aquaculture projects. Nordic Aquafarms' proposed farm shows very strong environmental performance and metrics compared to other activities and plans in Maine. We support development of this industry and other sustainable aquaculture activities in Maine. Many of the claims made from interested parties Belfast apply to the entire sector and have thus been relevant to address on behalf of the future of the entire industry in Maine.

The aquaculture industry is a young industry, but it has rapidly grown to provide over half of the global seafood supply. The industry is rapidly developing with a strong focus on food security, bio-security, fish welfare, and sustainability. This is being leveraged to create some of the highest standards in the international industry, here in Maine. Further know-how and research will be added along the way to continuously improve on the project in Maine.

Selective use of references by some in Belfast does not represent the general salmon industry position nor the qualities of the proposed farm in Belfast.