Norwegian deposit system – Circular Economy Par Excellence

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Thank you for the opportunity to present our deposit system. Now that we've had a chance to hear several good presentations about why deposit systems are so great, I think that most of you are now probably in favor. From a producers' standpoint, they may see their products as a one-way bottle, but it is not one-way material. If you set up an efficient system to collect those bottles, you can achieve higher collection, help drive the circular economy, and reduce the littering problem. At Infinitum, we believe in the eternity of materials, that materials should live forever, and this is what the deposit system allows to happen. Our members produce their products (beverage containers), sell them to the consumer, and then we take it back from the consumer so that it can be reused and recycled again and again by producers.

I think there are some important topics or questions to ask, one of which is "What's the problem that we're trying to solve?" Littering and conservation of resources are two big ones. I think it's important to focus on resource conservation because when containers are collected, you are avoiding having to manufacture and consume more resources but you also will reduce the littering. If reducing litter is the primary focus, then you will collect material but you won't know what to do with the collected material. And then you have the question: "What's the collection rate?" and "How can we achieve the highest collection rate?" because it's important to get the material back. The next question to ask is "What's the yield in the collection rate?" "How can you use the material again and try to get as much material as possible back into the production cycle again?" That's also important. And then, of course, for the producer and the consumer, it's also important to ask "What's the cost per unit?" and "How can we achieve the lowest per unit cost?" Producers and consumers want the lowest cost possible and don't want to pay more than they have to. The good news is that deposit systems don't need to cost more if you have the right setup. I think this is important. Setting a target for reuse of the material is also very important and I believe is a discussion we need to have.

This is a film from the Netherlands. I have to admit that their deposit system is a bit strange as they only have deposits on big bottles, not small bottles and cans, but they are working with it. They performed a little experiment to see how people would react when they saw a pile of non-deposit vs. deposit containers on the ground in a city square. Would people pick them up? Sure enough, they found that when you assign value to a material (i.e. a deposit), someone will pick it up. I think this is rather important.

For several decades, producers have been strongly opposed to deposit systems. In 2017, they began to shift their stance, and now they are working in favor of deposit systems, although there is still some work to be done to really shift their mindset and get them on board. But increasingly, we are seeing producers in various countries come on board and say, "OK, this is important," Mattoni for example. I was very pleased with their presentation earlier today; he had so many good points about what can actually be achieved when a producer has their focus in the right direction. So that's good to hear.

Here is another film from the Netherlands, which was used to convince people not to shut down deposit systems after producers in many countries were arguing against it. The film was used to tell people that the system should not be repealed, but in fact enhanced to also collect the smaller units. I don't think this is a problem anymore because producers have for the most part shifted their mindset but this was certainly the situation after 2015-16.

Now I will say something about the Norwegian regulations and market. Norway's deposit system is 100% producer responsibility; the producer pays a fee and covers 100% of the costs for operations. Infinitum compensates participating retailers for the area required to collect containers; we purchase the RVMs; pay for the staff they need to run the RVMs; and pay for all the logistics. In addition, we sort and bale the material in our own plants and then ship it to the recycler who then pays us for the material. All of this is included in our value chain, so we have embraced the concept of circular economy in the deposit system since the start.

It's worth noting that Infinitum is one of three deposit system operators in Norway. Infinitum is a privately-owned "value-chain company." We are not non-profit, but we strive to achieve the lowest costs possible because we are working on behalf of retailers and producers. In fact, retailers and producers started Infinitum in 1999, and they own us 50/50. Our board is made up of representatives from both industries. The current chairman of the board is the managing director of Coke in Norway.

If you look back in time, 50-100 years ago, you'll notice that all countries had "deposit systems" because beverages were packaged in glass and people had to take back those bottles for recycling. But then single-use glass and PET bottles entered the market, and a lot of companies shut down the system. We never did in Norway. So before Infinitum was even established, there was already a deposit system in place for refillable PET bottles. For 15 years, we actually operated in parallel with refillable and non-refillable bottles. I'll show you some pictures later on, but that's been the situation in Norway.

Now a bit about the Norwegian market. In 2017, 1.2 billion cans and PET bottle were put on the market. Approximately 22,000 tonnes of PET was recovered. In Norway today, it is possible to produce PET bottles with 80% recycled content. Earlier today we talked about bottles with 50% recycled content; we managed to achieve that within one month and also replaced our labeling. So countries that have a deposit system can achieve 50% recycled PET content in their bottles tomorrow; we achieved 80% in a short period, and can supply it today. Norway also recovers 9,300 tonnes of aluminum. For plastic, we don't require huge tonnages in order to have an efficient value chain, to have efficient recycling. For PET, all you need is 10,000 tons and if you have 20,000-22,000 tons, then you have efficient recycling for food-grade plastic.

This slide shows the deposit fees in Norway, which just increased in 2018. Depending on the size of the container, the deposit is 2 Norwegian krone (containers of 0.5L or less) or 3 Norwegian krone (containers above 0.5L), which is equivalent to about 20 euro cents and 30 euro cents for big bottles. As I've already pointed out, if you go back in time, you'll see that all countries had deposit systems, but these have all been shut down. Now, we're starting to see these systems come back, as retailers, producers, and politicians realize that they need to do something, that they need to get this material back, and they see that deposit systems are an efficient way of doing that. One big difference between Norway and other countries with deposit systems is that in Norway, it was the producers and retailers that set up the system. There is no regulation that says we *have* to set up a deposit system. But, what Norway does have is an environmental tax. So the system is essentially voluntary. For producers that are not a member of the collection system, this tax makes it very costly to put a can or PET bottle into the market. In 2018, for example, the environmental tax on a glass bottle or metal can was 0.56 euro/unit. The tax for a plastic bottle was 0.33 euro/unit and for cartons and cardboard 0.11 euro/unit. Those are the tax levels if you are not member of a collection system. This is why producers and retailers decided to set up Infinitum, because it reduces their costs. Infinitum's deposit system has the highest collection

rate (about 95%) and the environmental tax level for the members is zero. We report as a system, on behalf of all our members. I think this environmental tax model set up by the politicians is interesting because it means that we have had full support from producers and retailers since the start, since 1999. So our system is 100% producer responsibility; in other words, they cover the total cost of the operation. There is no cost to the municipalities, no cost to the government, and only a very small cost to the consumer.

This next slide shows the four different systems we have for the collection of beverage containers in Norway. First, we have the curbside system, which collects one-way glass and metal containers. Producers of beer cans can join this system but because but they report lower collection rates, they usually join the deposit system instead. In fact, 99% of the cans sold in Norway are part of Infinitum. Then you have the refillable system that used to be operated by Rentpack. This was the system for refillable glass and PET bottles, but it was shut down in 2015 because it was too costly. It's more cost-efficient and environmentally-efficient to have a one-way packaging system as long as you reuse the material. And then you have the Green Dot system, run by the municipalities. Producers can also join this system and sell a plastic bottle in Norway without deposit but they have a higher tax than Infinitum and they report lower collection rates, around 88% or 82% (and about 60% of that is actually energy recovery). So all this to say that even though the deposit system in Norway is voluntary, almost all of the products sold in Norway have a deposit mark because that is the lower cost option, and also has the lowest environmental cost.

In Norway, the deposit return machines only accept two types of plastic bottle, with approved labels and even approved glue to affix the labels. I think this approvals process goes for all deposit systems in the Scandinavian and Baltic countries. Before a producer can join the Infinitum system, they must register their products and submit their bottles to Infinitum for testing. We check everything. That's what's nice about having a deposit system; you have the possibility to check what type of glue, label, and caps they are using, and you can say "no" to glues and labels that will cause issues in the recycling process. This allows us to produce very good quality material that can be reused again and again, because we know that there is nothing in the bottles or cans that will create a problem in the recycling process. This is very important when we think about "design for recycling" and increasing the recyclability of a product. In the Green Dot system, you will see a lot of PET bottles with a glued on aluminum lid, for example. This creates issues for the recycling process and ultimately reduces the yield.

This next slide describes the process for joining Norway's deposit system. The only thing prescribed by regulation is that producers who join the deposit system must mark their containers with a deposit symbol. Everything else is regulated by the agreement made between Infinitum and the producers and retailers. So we put into the agreement what's important regarding the barcode and deposit mark, the approval for the packaging, and so on.

This slide shows the fees that the producers or importers must pay. You'll notice that for aluminum there is a negative amount (0.03 Krone). This is because right now, we're actually paying producers a per unit fee for every aluminum can they put into the system because of the material's high value. For steel and PET bottles, the fee is 0.21 or 0.15 krone. This will also go down in January of next year. So this is the total cost for the producer to register their products in Infinitum. Of course, this cost will be absorbed into the product price as well. For producers who choose to use a universal (standard) barcode, there is an additional fee per unit. As part of the registration process, producers can choose whether to use a universal barcode (which allows the beverages to be sold in both Norway and Sweden)

or a barcode unique to Norway. Unique barcodes carry lower fees since they prevent consumers from being reimbursed for a container they bought outside of Norway, on which a Norwegian deposit was not originally paid. In contrast, universal barcodes carry higher fees since they are intended to effectively cover the costs of the increased risk of fraud. RVMs in Norway can accept some foreign beverage containers, so that they are recycled, but they will not refund a deposit. And then we have an additional fee for light blue and other colored PET bottles. This is because colored packaging has fewer possible applications after it has been recycled and can sometimes have a negative impact on the recycling process. So, while producers can choose to package their products in colored bottles, doing so means they will pay higher fees because the income we can get from that material when selling it will be lower. We have set it up this way in order to encourage producers to choose the solution that's actually the most efficient for the deposit system. It basically rewards producers that use the best quality material (clear light, clear PET bottle or aluminum can) with the lowest cost.

This next slide shows the handling fee that we pay retailers as compensation for handling, receiving, sorting, and storing used beverage containers. In Norway, the handling fee paid to retailers depends on the mode of collection. Retailers using a compacting RVM receive a higher fee than shops that take containers manually, or do not have a compacting RVM. This is intended to reflect the transportation efficiencies generated by compacting the containers and the fact that compaction reduces the opportunity for fraudulent, multiple redemptions. It's important to note too that different values are attached to different materials, as these again carry different storage and transport costs. So, for example, a shop that collects an aluminum can using an RVM with compaction is paid a handling fee of NOK 0,20 while a shop that collects it manually is paid NOK 0,05. The handling fees are intended to cover the costs of the retailers' investment in the RVM, the area used for collection and storage, the workforce required to operate the RVM, everything. It's worth pointing out that in Norway, the use of RVMs (or RVMs with compaction) is voluntary, so retailers (especially small ones) can still opt to do collection manually, or to purchase an RVM with no compaction abilities. It's just that these retailers will receive lower handling fees because their costs are lower.

Now for some key figures. Infinitum publically reports our collection figures in an annual report. The reason we do this is because, about 5-6 years ago, a lot of the Green Dot systems were reporting very high recycling rates and we said: "These figures can't be right." That's when we decided we would report exactly how many beverage containers are sold on the Norwegian market; how many containers we collect through RVM; and how many containers are found in household garbage. We also said we'd report on the losses in these systems in order to show the true figures. We then received a lot of questions about our figures and how we came up with those numbers, what calculation we used. This started the discussion in several countries, including Norway, about what's *actually being collected* for recycling in Green Dot systems. The Green Dot operators in Norway began to acknowledge that they had to start reporting the real figures and started to adjust their calculations accordingly. I think this is important, because if you are going to solve a problem, you need to know and have facts about the problem before you can try to solve it. So this is why we report publically on these figures: what's coming into the RVM, what's taken out from central sorting, from incineration, from separate collection system, etc. This is all part of the calculation.

Now for another topic: collection rates. I think it's important to understand that when you first set up a system, you will have very low collection rates. This is not to say that the system is not working, but can be explained by the fact that it takes some time for people to return containers for recycling once they've been purchased, and it also takes time for the new stock of containers (with deposit markings)

to replace the old stock of containers (without deposit markings). To explain I like to use the analogy of a hose watering a garden. If you want to water your garden, the hose needs to be filled with water before a drop will come out of it. In the same way, when you set up a deposit system, you have to fill up the warehouses and retailer shops with deposit marked product and sell those products to consumers before you will see any come back into the system. And you will always have a certain amount of containers in the value chain itself. In Norway, for example, we have total sales of 1.2 billion units but 200,000,000 units are stored in the value chain at any one time. So when you introduce a deposit system for the first time, it takes between 2-3 years before you start to see higher collection rates. In effect, in the beginning you are actually receiving a micro loan from consumers because the deposits they are paying will be used as the cash flow needed to set up the system. I think that's important to understand because it means you don't need to have a huge loan to set up a deposit system. This is the collection rate for small bottles, big bottles, and then the average collection rate for both combined. So on average today we collect 88% through RVMs. The EU has set a collection target of 90%, which we very much support. I know this is possible, because we increased the deposit values in Norway in 2018, and we expect to reach a collection rate of 92%, 93% within 2-3 years. So I think it's a good thing that the EU has set this new target.

This is a slide from a municipal waste handler system in Norway. This guy went public and asked people to please take all the containers with deposit markings back to the shops and to not put them in the municipal waste collection containers. He said that in this area, which has a population 190,000, that he had to pick up an additional 40,000 garbage bins per year because people were putting those containers in the municipal system. That's an additional cost, so he said: "If you take these packages back to the stop, it will decrease the cost for the municipality waste handling system." I think this is important because a lot of countries think that if PET is taken out of the system, then the cost of municipal waste handling systems will increase because you are removing a valuable material. But this is not true, and it's actually the opposite: municipal waste handling systems will actually see savings from keeping PET out of the system because these containers are very voluminous and take up lots of room in collection trucks. Even when the revenue from the sale of PET material is taken into account, there is still net savings to the municipality. That's important. So on this point we agree with the director of this municipality waste handling system and we tell people: "Can you please put your empties into the RVM so we can have the joint data from the municipality and from Infinitum?"

Now for a little bit on logistics and production. In Norway, we have three facilities that take in the material, sort, and bale it before we sell it to the market. As I mentioned before, there is collaboration between Green Dot, municipalities, and Infinitum. Norway is a country with 5.5 million people, and we have 11,400 manual return points. Anyone collecting material can be a member of Infinitum and receive deposit payouts. An individual cleaning up a soccer field can put the empties into our bags and have it picked up from their household and receive deposits for these empties. We do this because it's important to have an efficient and convenient system for the inhabitants. In addition to the manual return points, empties can be returned to approximately 3,600 shops with RVM. We also have 35 logistic hubs and 3 production facilities. In 1999, the startup cost for shops in Norway was 500,000 euro. This is for the shops that invested in RVMs, which is covered by handling fees. Small- to medium-size shops may not want or need an RVM at the beginning, but may decide after a year or so, after seeing the volumes that come in, that they'd like to invest in one.

Of all the material we pick up from shops, approximately 93% is collected through RVMs; 7% is collected from the 11,400 pick-up points without RVMs; and less than 1% is from companies with internet grocery

sales (e-commerce). For e-commerce sales we have produced a 50-liter bag that we deliver to consumers when they purchase beverages through the Internet. We do this because in Norway, the regulations state that all outlets selling beverages with deposit are obliged to accept deposit bottles/cans and pay out the deposit refund as cash, regardless of the size of the shop or whether the sales are made online or not. So consumers have to buy this bag, but it's not a big deal to them because it's cheaper than two shopping bags in Norway. The bags contain a unique barcode, which our logistic partners scan and which allow us to know exactly who owns which bags. Consumers buying online will receive the deposit back the next time they buy beverage containers on the Internet. In our experience, companies with online beverage sales are very satisfied with this solution because it means that their customers won't need to go to other shops. What will the future look like? I don't know, but this is efficient for us.

It's important for us to adapt our program depending on what's going on in the market and where beverages are being sold/consumed. This leads into the topic of on-the-go. We see that when people are at the park or at school, because they only have one bottle or one can, they put it in the garbage bin. So we implemented the idea of using refurbished oil barrels to collect empties, which we've placed in schools, common areas, and at different offices. Schools are now buying these barrels from us and they like it because they can get the deposits back for the containers they collect, instead of those cans/bottles being placed in the garbage. Schools have also experienced lower garbage handling costs since buying these barrels from us. So this is efficient. We have placed similar collection containers in public places like parks, and people are using them. Without these containers, people might just leave the empties on the ground or next to garbage bins. But then these containers eventually end up in our oceans, as marine litter. By putting these collection containers here, people will pick bottles/cans up and bring them to a shop to get the deposit back. So this is another collection scheme we have; another way in which we're trying to make it easier for the consumer. Returning deposit bottles should be efficiency and easy for them.

This slide shows what it looks like inside our facilities. We sort the material we receive by container type and color. We have the clear bottles and we have the aluminum. We also sort blue, light blue and green bottles so that we can sell them separately because the pricing is going up for the green bottles. And this is what we sell to the recycler. We are always working on improving the quality of our material because the higher the quality, the more income we can get for it, which means lower EPR costs for the producer.

The next few slides have to do with cost-efficiency, carbon footprints, and reuse. As stated earlier today, there's been a lot of LCA studies done recently, and these are important. We started doing these 3 or 4 years ago after I got a call from a journalist in Norway. This journalist told me that we should stop handling the garbage in Norway because we were having a greater environmental impact than the municipal garbage handling system. So I said to this journalist: "OK, if this is true, then I shall shut down the deposit system. But can you give me six months to see if this is the case? And then he said: "Yes, I'll give you six months." And then I gave him the figures from our LCA report and was able to show him that DRS is actually much more efficient.

These figures are from the LCA report. This one shows the difference in environmental impact of putting a PET bottle into the garbage bin and sending it to energy recovery or placing it into an RVM having it recycled. The average 1-liter PET bottle requires about 1 kilowatt hour of energy to produce, so that's what you are saving if you put it into the deposit system instead of into the garbage for incineration. All

of these reports are public, in English, so you are free to download and read everything from this report. We have prepared LCA reports for both PET bottles and aluminum cans. Basically, if you input 1.5, you will get 142 back. I think that's a good deal; that's an environmental payoff of 9,467 percent. I think that actually will be the best investment ever. That's, when we collect one functional unit, there is an amount of plastic for 1,000 liter of a PET bottle, that's thirty-six kilogram of plastic. The total emission from the deposit operation and recycling for this plastic material is 1.5 kilogram, then you will save 142 kilogram compared to producing PET bottle from virgin material, all time. That's a huge impact and that's actually interesting because normally I am talking about how to get rid of single-use plastic and, of course, we can stop using some of the plastic but the reality is: plastic is the absolute most fantastic material that we ever have invented because it's so efficient to produce and so efficient to recycle if you do the recycling or design for recycling. This is the figure from the report, I'm not going into details but this showed emissions if you have a deposit system at the collection rate and the total when you use virgin material in the bottle, if you have 80% recycled material, then you see the decrease in the CO2 emissions. The report also shows energy uses and also 4-5 other environmental topics that you can look into. I think it's interesting because if you look into the system, you see that plastic production is the main source for environmental impact. But still it's interesting to look into the different collection systems. And we did it first, I'll say, report in Norway together with the Green Dot, the municipality waste handling system. And then you see that the emission from transport and RVM in the Infinitum system, compared to the Green Dot system, is 1/3. So, with regards to logistics, it's actually much more efficient to have a deposit system compared to the municipality waste handling system because we use the same trucks to take-back containers compared to municipalities that need to go around with a truck to pick up. So, if they have a deposit system, you also reduce the environmental and logistic impact from the municipality waste handling system. When you look at an LCA report, it only shows the results for one lifecycle. It stops after one trip. So we did additional studies to show what's actually achievable when you have a deposit system because with a deposit system the same bottle can be recycled again and again. Yes, some virgin material will be needed, but, as stated earlier today, if you have virgin material, in Norway, we use 22,000 ton of PET material, you have to fill up with that every year. If I had a Norwegian producer to use all the material that I collect, eighty percent, then people only need to fill up with twenty percent, two, 4,400 ton of PET material per year. This represents a huge saving: 18,000 ton that we can save every year if we have taken all the material back. The focus now is to increase the amount of recycled content. 50% is easy, 80% is possible, so that will really help when we can have this material and then we can reuse material again, again and again, and, as long as you mix some virgin material, you can actually use PET material for a long time. This is another way to show because, back in time, a lot of system was comparing refillable system with non-refillable systems, so we see, if we have 80% and we actually have five trips for the material, if you have 100% collection rate, then we have 12.5 trips. So this is for the people who are interested in comparing the impacts of refillable vs. non-refillable systems. But all of this is in the LCA report.

This is the last slide. This is a very famous hydro project in Norway that was built in the 1970s. In order to build it, we ruined a nice salmon lake to build it. Then we had this whale in Norway that washed up on the beach with a stomach full of plastic bags and everyone said: "We need to stop using plastic! We need to bring the glass bottle back." But people have forgotten that glass bottles can also cause problems for animals and people, especially when they break into pieces and are sharp. I think it's also important to think about the energy requirements for making glass bottles. In Norway, if we shift the volume of 22,000 ton of PET back to glass bottles, we need energy of 2,640 gigawatt hour. That's equivalent to the amount of energy that could be produced by four of these hydro plants. What's most

important is that we collect the material. In the future, we will also look into different types of material to see how we could decrease the energy consumption as well.

So what are the benefits of deposit systems? As stated earlier on, one of the benefits is no littering. Less than 1% of beverage containers are littered in Norway. Deposit systems also have lower collection costs compared to municipal waste management systems. They also provide a base for recycling businesses. This is a relevant point, because if you look at Europe, the PET recycling business has been in a decline for a long time. In Norway, PET recycling is actually going up again because of this discussion about using and setting up a deposit system and reused material. Another benefit is reduced cost for municipalities, reduced need for oil and other virgin inputs, and reduced marine littering. That was it for today. Thank you.