



Air Liquide Investor Day

Friday, 30th November 2018

Air Liquide Investor Day

David Meneses: Welcome, everyone, and thank you for joining us today. I'm David Meneses, Group VP Sustainability of Air Liquide and I have been in this role for a year and a half now. So, I've had the chance to meet some of you already during sustainability roadshows and I'm sure you felt how passionate I am about this role. While you recognised the initiatives that Air Liquide drive to address sustainability challenges, you often ask me about our objectives, climate being the most important topic to many of you.

But you know Air Liquide and you know we like to build on something concrete. So, today, not only we are ready to disclose our climate objectives and the business opportunities it will bring, we have also launched many initiatives that show our commitment to meet this important challenge.

Because it is an important moment for the group, we have organised this event, and several executives are here to share with you today. First, Benoît Potier will introduce the meeting. He will present our commitment for the coming years and show how this strengthens our sense of purpose. Frédéric Despréaux will outline the concrete initiatives related to the reducing our own carbon footprint. Since our new strategy is focused on customer-centricity, François Jackow will address the customer dimension and the solutions we bring to them. And because innovation is at the heart of the group, François Darchis will open up the perspectives and will present our role in developing new low-carbon ecosystems.

Now, I'm sure you wonder how these climate objectives will serve and contribute to our financial performance. So, Fabienne Lecorvaisier, our last speaker, will answer to this important question.

Throughout the morning, we will provide you with some concrete examples either through testimonies from business experts during this presentation or in the corners that we have installed in the cocktail room. We will welcome all your questions at the end of the presentation and we can discuss further during the cocktail lunch.

So, thank you again for joining us today. And now, I hand you over to Benoît Potier. Benoît, please.

Benoît Potier: Good morning, everybody. We are very pleased to be with you today. It is all about combining value creation, the economic value, and a sense of purpose and I think that's an interesting challenge in a company like Air Liquide to be able to do that. We are three days ahead of the COP24 and this is why – climate is very timely, of course, and it's a key topic.

On the graph, you just have the usual business as usual which is leading to – absolute increase in emissions in the world and we are now all familiar with the 2-degree scenario and even 1.5 scenario.

We think that industry as a whole has a key role to play in helping to reduce the greenhouse gas emissions. And how? By working on our own emissions, we'll see that we can do that, but by also bringing new solutions to the others to the world and we will also share what we can do in that regard. We think its urgent to act and we are ready to take a certain number of actions as you will see later. We'll try to make it work.

So, our commitment in that regard is not new. We've been really embedding in our ambition, which is to lead our industry and deliver long-term performance, but also contribute to sustainability. This is what we have faced for many years. And we've been acting responsibly, as well. How have we been acting?

Number one, by working on limiting our CO₂ emissions, and you will see that it relates to production, on the one hand, transportation on the second hand, but also by working and offering solutions to customers and this is the approach I'm going to detail in a minute. Air Liquide is a signatory to the United Nations Global Compact. We have signed and taken this commitment and we have set very high standards in terms of ethics and respect of human rights for conducting our business. So, it's a global sustainability and responsibility. This responsibility is assessed by rating agencies and you have a list on the screen, MSCI, CDP, Sustainalitics and Ecovadis. We have recently improved our ratings, which shows that we are going in the right direction. But we would like now to take a new step.

And I will start just by explaining again, this is things that you know that are core business. Our core business is related to those very small essential molecules that are at the heart of life, matter, health and energy.

And I think that when you realise that oxygen is everywhere in those processes, and we can easily figure out what it means. Hydrogen is also at the heart of energy and also at the heart of the reduction process in chemicals. Nitrogen, we'll see solutions where we can use nitrogen for cooling, temperature – managing temperature, which is related to energy. And carbon dioxide has normally the bad role in that game, but we also have to realise that carbon dioxide is essential for nature. Because it is the food for nature. The only problem is the balance. So, we don't have to get rid of CO₂. We have to make sure that the balance of the CO₂ is acceptable.

When we think about the solutions, we've been implementing a lot of solutions not just for emissions but also for air quality, and I just like to raise that point because you will see that most of the emissions of Air Liquide today that are related to the production of hydrogen, which has a goal, which is to improve the air quality. It's actually to remove the sulphur from the fuels because the sulphur in the fuels were responsible for health issues. So, also for the planet it is important to have this balance between quality of air and emissions. Two different things and two different timeframes. Health is about today and climate is about tomorrow. And this is another thing we have to keep in mind globally.

So, you have illustrations of things we did. Supply products by pipeline, on-site, which actually reduced transportation, so emissions. We have lighter cylinders today than in the past, less weight carried in – on the road. And we have all of those clean mobility issues that we have tried to work on. In terms of process, we'll be detailing oxy-combustion and I just also mention the fuel and the removal of sulphur in the fuels. So, it's a continuous approach. It's not new. And we've been embedding all that into our business.

Now, let's take just the global view of what we are talking about. Humankind is emitting about 33 Gt. A gigatonne is a billion tonnes of equivalent CO₂ in the whole world. Now you have a split there between transport, which is 7.4 Gt; industry, which is about one-fourth, 25%; power, which is significant, about 40%; and the rest: buildings, agriculture and the like.

And we have just put the Air Liquide dot on that pie chart, which is 26 Mt. I will detail that in a minute, 26.2 million tonnes, which is 0.08% of all the emissions. Now, it's very small, but

it's not negligible. And I think we have to care about this portion and if everyone did the same, it would, I think, be much more meaningful. Now, there is one thing I'd like to say because we are in a climate day, we don't oppose growth and climate, of course. And everything that will be presented today will be related to this good balance between ability to grow and ability to reduce our emissions. And I think the sustainability should not be totally disconnected from growth.

So, let's have a look at Air Liquide. Air Liquide is emitting today 26 million. Where does it come from? On the left part, you have 14 million, which is direct emissions. This is what is called normally scope one. Where does it come from? You have just a split. Its 8.6 million tonnes from what is called steam methane reformer, it is actually the production of hydrogen with natural gas. When we started doing that, it was for improving air quality. And what we did most of the time was to insource the hydrogen production from customers that were producing by themselves this hydrogen. So, at the planet border, it was not really a new creation but a transfer. But what we did was to have bigger scale plants and more efficient plants. So, at the border of the planet, we actually improved the system.

But as far as Air Liquide balance sheet is concerned, we put on our climate balance sheet, if I may say so, or environmental balance sheet, this quantity of hydrogen – of CO₂ equivalent.

The second point is cogeneration, we did exactly the same. Cogeneration means generation of heat and power at the same time, much more efficient than a separate generation of heat and power but it's now on the Air Liquide environmental balance sheet. So, those are the two main sources of direct emissions.

On the right side, you have this nearly 12 million tonnes which is essentially coming from the fact that we use electricity to produce oxygen, nitrogen, argon and liquid products. So, this is quite simple at the end. It's air separation units on the right side and hydrogen and cogen on the left side. The rest as you can see from the point seven on the left side down part is related to transportation. Transportation is important symbolically but in terms of numbers, it's very small.

On the right side, this is the avoided emissions that we have been able to generate outside of the Air Liquide perimeter and which we don't account for but it's just an illustration of the benefit that we can generate outside of the perimeter. It's about 16 million tonnes. So, with this 26 divided in two parts, and this 16, you have the global view of what Air Liquide is doing today in terms of emissions.

Now, what are the climate objectives that we will be detailing today?

First of all, we have a global approach. And to make it very simple, we can act on three things. One, we can act on our assets, because this is our decision, our investments, our way of operating assets. And we think we can reduce our carbon intensity by 30% by 2025 compared to 2015. Now, this is the number that we'll put on the table and that will be our objective for ten years. And we'll go into further details later. How, what are the levers, and how credible those objectives might be.

The second thing we can do, is to actually elaborate solutions for our customers. Those solutions will mean less emissions from our customers. And we'll detail some of those solutions.

The third action we can take is a contribution to the ecosystem. And you'll see that with biogas and hydrogen energy you can actually act and have a leverage which is much higher than just the Air Liquide emissions. Of course, I should say that everything we say here is compatible and consistent with our NEOS objectives. So, there's no big surprise in terms of financials, but Fabienne will come back on that later.

So, how do we do that? It's not just by – with a magic wand, it's not something that we'll create and then we'll wait. We have to embed those objectives into our process, into our decision process. And as you know, there's one fundamental process in our industry, is CAPEX, how we allocate CAPEX.

So, we have already decided to put a CO₂ price as a reference in the company. And every time we decide on a project, we actually look at the carbon intensity and we don't say today that either we meet a criteria and we go ahead or we don't meet this criteria and we stop, because it's not as simple as that. But we use a carbon pricing internally as a reference. And every single investment is decided after review of the carbon intensity.

We also look at the obsolescence of our assets. It's plants that are 10, 15, 20, 25, 30 years old, they are not the most efficient. And so, we could also invest to both get a financial benefit by reducing the cost, but also have an environmental benefit by reducing the emissions.

So, we will evaluate the asset base of Air Liquide and probably increase the CAPEX allocated to the energy efficiency and to the emissions, to improve our carbon intensity.

And the last point I'd like to make is that we also have embedded carbon – carbon intensity into the managers compensations. So, there is part of the bonus of every manager that relates to the carbon emissions.

And finally, I talked about assets, talked about customers, we need also to talk about ecosystem. We are engaged in active dialogue with all stakeholders. Number one, employees, I think what we do and say today is very important for the 68,000 employees working in Air Liquide. This is highly motivating, and this is really part of their future.

Customers, I explained already, there are customers ready to sign contracts on the basis of cleaner products. So, it's a reality already, it is starting. Of course, it's also related to authorities and general public.

So, we are engaged. We didn't want to only talk about hydrogen today. So, you will see that it's a balanced presentation. But, of course, what we did with the hydrogen council and all those players which are today 56 companies worldwide working together to push the hydrogen agenda, is a very significant action that we took, and I think it would play a very significant role in the global objectives.

One last point before I hand over to Frédéric, two things because they are important questions you asked to us – SBT, the Science Based Targets. They have not yet come up with a methodology for our industry. So, we are working for them, but we are not yet in the position to say we have a reference. And the TCFD initiative, we applied everything except the financial projections because the scope is not global. But if you have questions about that during the day, feel free to ask Fabienne or others.

I have done my part, so I will hand over to Frédéric to start the presentation. Frédéric?

Frédéric Despréaux: Thank you, Benoît, and good morning everyone. We at Air Liquide are absolutely convinced that end consumers like you and I, and the society at large, are going to call more and more for low carbon products.

And so, our responsibility, our role as a company is to start developing, preparing the solutions and the offers that will enable those products to come to the market through de-carbonised industrial gases. And we do so, I mean, this is a journey that is going to span over several decades, but the thing is that, it has already started.

And so, in that perspective, as Benoît just presented, our first commitment in term of contribution to the climate is to reduce by 30% the carbon intensity of our assets by 2025, compared to 2015. So, the carbon intensity here is expressed in kilogram of CO₂ per euro of EBITDA, and 2015 was chosen as the year of reference because it refers to the year the Paris agreement was signed.

Of course, as we want to achieve this ambitious goal, we want to continue to grow, that's what Benoît mentioned. And as we do so, as a matter of fact, our direct and indirect emissions until 2025 are going to increase. But as we do so as well, we're going to continue to avoid emissions that are – that would be elsewhere produced in the supply chain otherwise.

One thing that's – maybe to give you a better appreciation of the effort, the magnitude of the efforts that we have here, I would like to emphasise the fact that our business is made of a mix of activities. Portfolio management has already helped. The Airgas acquisition alone contributed to half of the improvement that you see between 2015 and 2017, but that won't be sufficient. Also, if you look at the large industry activity, we see the full impact, both in terms of EBITDA or in terms of carbon footprint, of the decisions we make related to growth opportunities, only four to seven years after the decision is made, once you take into account the construction time, and also the time for the ramp up of these assets.

However, it is key that we act now in all the activities, knowing that some of the actions we're going to take are going to contribute short term, and some of the actions will only contribute beyond 2025.

So, the three levers, main levers that we're going to activate are; first, to increase the portion of renewable electricity that we're going to buy. Second, we are going to accelerate the reduction of our energy consumption intensity on our production assets. And third, we're going to significantly reduce the carbon footprint of our bulk and package gases. Each of these levers is going to contribute several millions of tonnes of CO₂ abatement.

So, if we look at the first lever, the objective by 2025 is to increase the portion of renewable electricity by two-thirds from 6 TWh to 10 TWh taking into account our geographical footprint where we operate today. We are going to mechanically benefit from the fact that the governments in the countries where we operate have taken policies or are taking policies to support investments in the renewable energies for the mix of their own country. And should those countries meet their 2025 objectives, this is going to significantly contribute to this year. However, we want to go beyond that.

Anticipating the growing appetite of our customers for decarbonised and low carbon products, we have decided to add an extra terawatt hour to this first impact I just described. So, for

those of you who are familiar with the wind power industry, 1 terawatt hour represents the gigantic piece of land where you have 100 large wind turbines of 5 megawatt each.

Furthermore, we have also recently updated our energy purchase policy and we are now, since this year, asking suppliers when they quote to provide us their energy capacity mix. This is now a key criteria in order to select the best supplier.

So, what I propose is now to welcome Austin Knight. He is the COO of Air Liquide USA and he is going to tell us more about what's going on now in the renewable energy in the US.

Please, Austin.

Austin Knight: So, what comes to mind when you think of Texas? Oftentimes the traditional view is that of oil fields, cowboys, long-horn cattle. And, of course, there's some truth to that. But Texas has realised we cannot sustain ourselves forever on fossil fuels alone, and Texas is in the middle of a significant transformation around renewable energy. We like to say things are big in Texas, it turns out things are quite windy in Texas, as well. And if we look globally, it's one of the ideal locations for electricity generation from wind.

In fact, last year, Texas already led the United States in renewable energy production producing over 70 million megawatt hours of renewable power from wind and solar. That's enough energy to power 2 million homes for an entire year and that is growing. There's new investments happening. We've seen announcements recently from companies like Amazon and IKEA and Nike getting involved with wind power in Texas.

There are investment tax credits for developers and technologies are improving, so it's very attractive from a developers' standpoint, but those developers need buyers of this power that can commit to long term power offtake and that they'll take the power whenever it is generated, so whenever the wind is blowing, but also that can manage without it through some other means whenever the wind isn't blowing. And it turns out Air Liquide is ideally suited to participate in this, in the US.

So, within this power market, this is one of our largest industrial basins. We have 20 major production units there at across ten different locations and it is integrated with our own co-generation of steam and power.

And so, what that means is we not only have a footprint of need for energy to power our assets, but we also have the flexibility that the co-gen offers to allow us to manage through the variability of the wind and balance out the system, and we can balance those needs in a way that we can control and at a cost we can understand. And, of course, that will ensure that we can continue to supply all of our customers reliably.

And so, the business case for us was clear. And we've announced today that we've entered into our first agreement of this sort. Air Liquide designed a 15-year agreement for 50 megawatts of power coming from a wind farm that will come up at the end of 2020. And these agreements can be complex. They can take some time especially the first one, but it is very well-structured.

And what we've achieved from doing this is we have long term power supply over this 15 years at a stable price that is actually quite attractive. We're not buying certificates. This is power that we know is coming directly from wind generation and is 100% renewable and it is traceable. And so, that is the differentiator. It's a differentiator for our customers. It's something that

not only contributes to our own climate objectives, but of course helps us contribute to our customers' climate objectives, as well. So, we can offer decarbonised industrial gases that's reliable – that are reliable and is traceable.

And so, this is real. This is happening. This contract that we've signed this agreement already will account for 20% of our targeted renewable energy direct purchases and this is only the beginning.

Frédéric Despréaux: Well, thank you, Austin. I think it's really exciting. And congratulations on the recent signature. That's great. So now, let's look at the second lever that consists in reducing the energy consumption intensity on our production assets by 5% by 2025.

First, we will benefit from the fact that we have technology improvement that we can deploy on our newest assets and this is made possible, thanks to our research and innovation that is continuously pushing the boundaries on our core technology.

If you look at the third bullet point – sorry, here, I'm not going to follow the other. Benoît mentioned that we're going to put some emphasis in modernising our existing assets. So, we have or will allocate more capital to retire obsolete assets and replace them by the best available technology. We are also going to adapt equipment to the continuous evolution of customers demand on industrial basins, and you know that many things can happen above 15 years up or down.

So, we have already defined a very clear set of criteria to prioritise the best projects including less than three-year payback, the potential for replication of the project at other sites and of course, the impact that it's going to have on improving the carbon footprint.

Finally, if you go back to the secondary point here, for those of you who were present in 2016 at the Capital Market Day, and I think many of you were, I introduced a new programme, Smart Innovative Operations, SIO, aimed at leveraging our industrial data. We are now in the middle of the deployment of this programme and we are effectively valorising and transforming data from our 400-plus units across the globe, into value.

And so, for the sites that have been already converted, we already see a step change in terms of performance improvement, both in efficiency and in terms of reliability of supply. So, our objective is to accelerate the deployment and it's also actually to go one step beyond and to start to have – and link the data of our customers with our own data, and to work with them and co-develop optionalities that will enable to unlock new value strengths. And so here, we're talking about new synergies, new efficiencies and these will translate in the end to carbon footprint impact.

And so, in order to give you a better sense of where we stand on the deployment of this programme, we're trying to connect live with our Kuala Lumpur centre that is operating remotely our operations for the Southeast Asia. So, Jaswin, Guoning and Clément, da jia hao.

Clément Lix, Jaswin Ling and Guoning Zhang: Da jia hao.

Frédéric Despréaux: All right. Clément, what's going on in Kuala? Tell us.

Clément Lix: I am Clément Lix, manager of the SIO Centre in Kuala Lumpur. I am here together with two Performance analysts in my team: Jaswin Ling and Guoning Zhang and two Real Time Engineers: Kesh and Hee Hoe

Frederic introduced the SIO initiative in the 2016 Capital Market Day. Thanks to this program, we are doing a step change in energy savings and thus reducing our carbon footprint. Since this presentation, it became a reality: our centre was officially opened in January 2018.

We are being progressively connected to our 18 large production plants located in the 8 countries of our SouthEast Asia Cluster. 24/7, engineers behind us remotely operate the production plants in the best way to limit the environment footprint.

We leverage the millions of data we collect every day to optimize the production, thus reducing our carbon intensity, with cutting edge technologies like predictive maintenance and digital twin of our networks for forward looking simulation.

We wish to share with you one example of concrete realization with Jaswin and Guoning for Air Liquide Singapore. Please Jaswin

Jaswin Ling: Hello everyone, let me introduce you the Air Liquide Singapore pipeline network, which is located in Jurong Island, one of the most integrated and competitive industrial basin in the world.

Our network on Jurong Island is 180 km long, it connects 7 production plants from which we produce for oxygen, nitrogen and hydrogen gases and it leverages dozens of rotating equipments to supply gas and maintain pressure.

Each machine has a different behaviour, they come from different generation and different technologies and thus, their performance are quite different. Not to mention that the whole network has also its own dynamic as well, and all of these needs to be modelled.

That is why we need to introduce the advanced tools to perform this complex analysis in order to reach our goal. I will give the floor to Guoning to introduce them to you.

Guoning Zhang: Hello everyone. We leverage years of data and big data technologies to model all these machines and assets then we build a digital twin of the network, linking all these models together for optimization.

This helps to identify the ideal combination of machines such as compressors to be used and their individual loadings to achieve lowest power consumption. The optimized solution is implemented in real-time directly from Kuala Lumpur by the engineers on shift behind me on 24/7 basis. It has been live for months.

Clément Lix: Doing this we are able to deliver a step change in terms of energy savings, and it allows us to continuously bring competitive offers to our customers.

Frédéric Despréaux: That's quite impressive! Clement, I think you mentioned earlier predictive maintenance?

Clément Lix: Thank you Frederic. We were also able to detect early performance deterioration of some machine using predictive analytics by crossing tens of correlations of key parameters.

Using this new predictive maintenance tool, we are able to repair it, to recover its optimal energy performance, without any disturbance for our customers, enhancing reliability and reducing carbon intensity.

Frédéric Desprésaux: Well, thank you all. Thank you for joining us from Kuala tonight. So, enjoy the rest of the day and be safe.

Clément Lix, Jaswin Ling and Guoning Zhang: Thank you.

Frédéric Desprésaux: All right. Let's look at the third lever here that we are activating to achieve this first commitment. Our objective here is that over the next decade, we are going to reduce the carbon footprint of our bulk and package gasses by 10%.

So, first, the carbon footprint of these product is going to benefit from the first two levers. As you know, the large assets we operate to produce the oxygen, nitrogen, argon or hydrogen serve as the sources for the bulk markets and the package gas filling plant. So, when we buy renewable electricity or we are implementing energy efficiency projects, this will immediately contribute to the carbon footprint of those products.

In terms of supply – sorry, distribution fleet – and here again I'm jumping on the third bullet point – we have decided to make a significant change in curbing the footprint, the carbon footprint of our truck fleet around the globe. And the objective here is to convert by 2025 20% of the truck fleet to alternative fuels. So, here, we're talking about natural gas, bio methane and the likes. So, this actually has already been started in Europe and is rapidly expanding to other zones where we operate.

And if you look now at the entire supply chain for the distribution, we have already in the past decade or so, as you see here, already delivered a solid performance in terms of improvement, an almost 8% improvement.

Now, the point is to achieve the next level. And so, we are starting now a new programme called Integrated Bulk Operations, IBO, and the objective here is really leveraging on the big data. And here, you can imagine with 2 million customers and many, many trucks, this is really big data.

So, the point here is to reach the next level in terms of optimisation for a fully integrated value chain from the energy sourcing to production, distribution routine dispatch to the delivery of the customers. And we are absolutely confident that, we're going to have the most competitive, sustainable and reliable supply to our customers.

But to give you a better view of this specific programme I would like to welcome, Brett Wang, who is our Global Product Director, for bulk and on site. Brett?

Brett Wang: Thank you, Frédéric.

Ladies and gentlemen, now, I'm presenting to you our Integrated Bulk Operation, IBO programme. By leveraging digital, our IBO programme will break the silos in our operation to help us buy better, produce better, deliver better, save energy, reduce kilometers and reduce CO₂ emissions.

In our industrial merchant business, our commitment to our customers is to deliver our product in a safe manner, on spec, and on time. With our fleet of 4,000 bulk trucks, this represents one delivery every 12 seconds around the globe, to satisfy our customers.

If we compare ourselves with other industries, we are a little bit unique because our operational activity is covering the full value chain. This provides us with a unique position not to only

optimise each of the steps that we are mastering but the whole scheme as a fully integrated chain.

Operational production and logistic optimisation is not new. Air Liquide for years have been doing it to achieve efficiency and emissions reduction. But now, we are going to leverage digital, big data and computing capabilities to further improve our integrated supply chain, where each brick is connected to the cloud.

This is quite a transformation. Imagine, in just one single day, we predict the demand of our customers according to its behaviour, we use our most efficient production sites produced considering the energy price and CO₂ content, we deliver with our best located vehicle and optimum routine, and our customer will be informed transparently in real-time about the progress of delivery. This is what IBO programme is all about and this is what digital enables.

To realise this one single day story, the transforming step is to implement digital tools for easy and faster decisions. Nowadays, those tools are dealing with much, much more parameters than before such as weather and traffic conditions, energy prices, consumers market situation, et cetera, et cetera. By using this input, the tools will suggest the optimum operational choices to our supply chain managers to decide quickly.

So, while continuously improving the value to our customers, our streamlined process will be reinforced by IBO programme to further generate energy-saving and kilometre-reduction to achieve the 10% CO₂ emission reduction in 2025.

Thank you very much.

Frédéric Desprésaux: Thank you, Brett. I think this is really, really inspiring.

So, as a conclusion, I hope you now have a better understanding on how we're going to achieve this first commitment, again, of reducing 30% of the carbon intensity of our assets, and so the three levers again adding two-third of the renewable electricity that we buy, improving the performance of our production assets by 5%, as well as the bulk and package gasses by 10%.

Again, I want to emphasise again as a conclusion that this is the first milestone and it has to be put in the perspective of a longer journey. But as we are among the first movers here, I think it's – we are going to position the group in the best position to size the opportunities for the future.

So now, let me hand over to François Jackow, Group Senior VP. And as François is coming on stage, I would like to really give a big thank you to Austin, the team in Kuala, they are not connected anymore, but Jaswin, Guoning and Clément and also Brett for their intervention.

François Jackow: Good morning everybody. As mentioned by Frédéric, we are acting responsibly on our own assets that we control. But, of course, on top of this, we have a portfolio of more than two million customers. Most of them actually are in the manufacturing sector. So, they do represent a very significant share of the economy. The community, the turnover of those customers is well in excess of €2 trillion. So, we have a fantastic leverage to develop climate-driven offers for our customers and it will become an enabler for them to meet their climate performance.

As a matter of fact, when we listen to the voice of our customers, 90% of our Large Industries customers are telling us that environmental sustainability is one of the top three topics at the

moment. So, clearly, if we are able to meet those demands, that would be very significant business opportunities, a breakthrough impact on the environment.

So, what can we do to act for a clean industry? Basically, we can do two things. The first one is to provide low-carbon solutions and offers, and the second one is to work with our customers to co-develop breakthrough manufacturing routes to allow them to reduce their environmental footprint.

So, let's talk about the first one, the first lever, which is low carbon solutions and offers. First of all, when the customer decide to outsource industrial gas production versus making their own industrial gas, investing on their own dedicated plants, already by mutualisation of assets, by having economies of scale, by connecting with multiple customers to a pipeline network, for example, we can always provide very significant savings in terms of energy and in terms of CO₂.

This is what we are doing when we are connecting customers on our 9,000-kilometre of pipeline.

This is also what we have done for example in South Africa earlier this year when we have started the largest air separation unit in the world. We have saved 30% of CO₂ emissions compared to the first unit sold to tis customer in 1980s. This is equivalent to more than 230,000 tonnes of CO₂ being avoided every year.

So, overall, by just doing this over-the-fence, outsourcing, we can provide saving of energy in the range of 15% to 20% which allows our customer today to avoid almost 5 million tonnes of CO₂.

The second point is to limit the impact on emission from transportation. And Frédéric and others gave some examples this morning. But as a matter of fact, the best way is not to transport the product. And that's what we are doing with our more than 700 on-sites that we have today in the merchant market.

However, when we cannot avoid transportation, we try to make it more efficient. We try to limit the weight of the product that we are supplying. And we do that by developing lighter cylinders, using new materials which are 40% lighter than the traditional steel cylinders.

So, those examples really relate to solutions on how we produce and how we deliver our products to the customer. But really there is a great leverage on how the customer will use our product and how we will enable them to be more efficient.

So, a very good illustration of that is the use of oxygen, replacing air in their process. And one of them is the oxy-combustion. And if we look globally, our key customers and other industries are to date avoiding more than 11 million tonnes of CO₂ per year by using our technology for oxy-combustion. Let's see an example and listen to our customer which is using this latest technology which is called HeatOx.

[VIDEO PRESENTATION]

François Jackow: I think it's always a pleasure to hear satisfied customer and to see how we can help them in their business, for sure. That's why we are here.

I'd like now to talk about the second lever, which is where actually we get even more intimate with our customers, where we grow inside their processes and we work with them to really change their manufacturing routes.

The first case and the first illustration is actually when we go inside our customer facility. We identify where CO₂ is being emitted and we are able to capture and to use the CO₂.

We are legitimate and able to do that for two reasons. The first one is that we do master the technology to purify impure CO₂. The second one is that we have the usage, the application of CO₂, really creating CO₂ circular economy.

I'd like to talk a little bit more about that and actually listen to Amélie Carron who is the marketing manager on this segment and who's going to talk more about carbon capture and usage.

Amélie Carron: Thank you. Good morning. So, increasing concerns for the environment, but also increasing commitment from government, citizens, companies. Many solutions are being considered to help us reduce our carbon footprint. Many of these solutions aim at not emitting CO₂ or decreasing CO₂ emission. But some CO₂ emissions are hard to abate especially in the industrial world. This is why carbon capture is seen as a complimentary pathway towards the energy transition.

As a CO₂ emitter, Air Liquide wants to be able to capture part of the CO₂, and doing so by leveraging technologies. Our technology of Cryogenics, membrane, process engineering. This is a way to abate large quantities of CO₂ on a very short term and on existing assets.

But we also want to use this know-how, this expertise and apply it to our customer processes. And particularly to our customers with high carbon footprint, steel, cements, chemicals. We want to share our expertise in CO₂ transportation and be involved in the development of new CO₂ usages.

Air Liquide has been involved in carbon capture utilisation and storage for many years. To quote just a few examples of this, Lacq project many years ago in the southwest of France, with Total at the time with the carbon capture and storage project to store CO₂ under the ground.

More recently, a project in Australia, an oxy-combustion project with carbon capture at the end. We are also – and I think this is the picture of it, operating hydrogen production units equipped with carbon capture in Normandy Port Jérôme. This one has been running for almost three years now and it is using our own proprietary technology called Cryocap.

Today, we are participating to new initiatives. Air Liquide is part of a large-scale carbon capture and storage project in the Netherlands to store CO₂ offshore underground.

We are involved also in electricity generation project in the United States with carbon capture. We are partnering with a start-up called Solidia whose purpose is to trap permanently CO₂ of concrete for construction, for example. And we are leveraging our contact with strategic partners in the chemical industry to co-develop new utilisation of CO₂ into the chemical processes, into the chemical production to be part of the circular economy.

Carbon capture is one of the solutions and at Air Liquide, we have competencies and we can contribute to it. And we believe that carbon capture can play a leading role in the energy transition.

Thank you.

François Jackow: Thank you very much, Amélie. So, we talked about another example where we get even more intimate in the customer process. We have – basically – we work with them

to really have a breakthrough innovation to change the way they are operating their own units and reduce their emissions.

And I would like to provide two examples which are in very different industries. The first one is in the steel industry where you can use hydrogen in a traditional blast furnace or in a Direct Reduction of Iron ore unit (DRI), which can lead up to 80% reduction of the amount of CO₂ emitted per tonne of steel; so it is very important.

The other example that actually you will have an opportunity to see later on, in a booth upstairs – which is in the electronics industry in the semicon manufacturing where we have been able to develop specific molecule which will replace etching agent. We replace molecules which have very strong global warming potential. And with only one single molecule, one single contract, one single customer, basically we are able to save the equivalent of 1% of the emissions of total semiconductor industry for one year. So, it is quite impressive. I'm sure that you'd like to learn more about that.

So, we see that clearly, there are opportunities. We see this area as a way to differentiate, to bring value to our customers and to really be their enabler to meet their climate performance and become strategic partner.

So, I will finish here, and just say that what I've been discussing and presenting so far is regarding what we do and what we can offer to existing customers. So, I'd like to turn over to François Darchis who is going to talk about how we can reach new customers. Thank you.

François Darchis: Okay, thank you, François. We have a broader objective for a new low-carbon society. And clearly, it's a dream that we would turn this society which is today based on carbon to a society based on much lower value of carbon.

So, we'll illustrate that on four levers – the first being the circular economy, the second clean logistics, hydrogen clean mobility and hydrogen global economy. Before going into those four levers, I would like to point out four elements. One is that now we have new stakeholders. We have the public demand. We have NGOs. We have policymakers. That's a big element we did not have before.

The second one, there is a necessity for open innovation because when you turn a society based on carbon into a society based on lower carbon content, it's not us alone. We'll have to innovate but with others. So, open innovation will be a key element of this new world.

The third one is business models. We need to revisit all business models because they have been based on 100 years of history. So, they are very well-established. And now, we are getting to a place where everybody, all players have to find their own way.

And the fourth one, which is even more important than ever, is time. Don't imagine that this new society will appear in a couple of years. It will take time. So, we need to manage time. And those levers, we will see are in fact very well-organised in a way that they can provide new solutions now, tomorrow and the next years to come. And it will gradually turn the society into a low-carbon society.

So, about the first lever which is the circular economy that everybody speaks about, so it's quite common. The basic of the circular economy is to turn from a linear model which is that we use natural resource, we produce, we emit and we continue using natural resource is a model that will be more and more challenged because of two reasons. Firstly, resources are

limited and the second is that the waste is not acceptable anymore either in the water or the air.

So, the circular economy is basically to use as much as we can the waste to reduce first of all emissions and, second, to reduce the use of natural resource. And that's what we are going to illustrate with the first lever which is the biomethane. So, let me introduce Philippe Merino, our Vice President of Global Market and Technology who will give you more about biomethane.

Philippe Merino: Thank you, François. Good morning, everyone. As you may know, biomethane is today the only solution for transportation that can tackle both the particles in NO_x emissions and the CO₂ emissions. Biomethane is already used today as a low-carbon alternate to natural gas for industry. And tomorrow, it will be one of the pathways to the decarbonated hydrogen. All this explains why this biomethane business is growing so much and that fast.

I would like to focus on three points of the biomethane business for Air Liquide today. Number one, its size; number two, its global reach and global scope; and third, I will unveil the recipe that allowed us to make all this.

First point, the size. So, today, the biomethane business is €100 million sales per year for Air Liquide. And this is based on our proven technology and a proven business model. We started from zero in 2014. And today, we run 12 plants and we have several others in construction. We also operate more than 60 distribution stations and we have ten more in construction. So, we have a proven technology. The business model is proven as well. We buy raw biogas. We have long-term contracts to supply biomethane to the network everywhere in the world. And we take part of this biomethane for our own distribution stations.

I come to the second point. Air Liquide is the only player in the biomethane business that has both a global reach and a global footprint. Biomethane is a global business. We are in Norway, Sweden, UK, Italy, France, the US and we're exploring opportunities in Asia and South America.

Air Liquide is also present over the full value chain. We started on the biomethane purification where our own proprietary technology membrane is used. Now, we are present in biogas production, purification, injection, distribution and liquefaction.

Now, the unveiling of the recipe. It is composed of two ingredients – constant innovation and the right organisation. We have kept on innovating on technology, developing new membranes with even better recovery rates for methane. We also innovate on business offers – for example, by combining liquid nitrogen and biomethane for a completely clean cold transportation of goods.

The organisation now. In 2015, Air Liquide opened a new activity – global market and technologies. That was a specific, agile and entrepreneurial activity organisation that aimed at developing new businesses especially in the field of energy transition. And so, you see that by mixing innovation and the right organisation, we have been able to create this biomethane business. And we count on leveraging on this experience for others to come.

So, in conclusion, the biomethane business is a €100 million sales per year business that serves the energy transition. It serves local communities with circular economy solutions. Its business model is proven and all this is based on our own proprietary technology. It sounds like a vision.

I would say it's not a vision anymore. This is where we stand today on the biomethane business. Thank you very much.

François Darchis: The second lever is clean cold logistics. There is a need to bring food in the cities using refrigerated transport. Most of the generators currently on the market produce cold using a standalone diesel generator. However, clearly diesel will not be as welcomed as in the past and we need to have alternative source of cold.

Here, we are leveraging what we know very well, which is liquid CO₂ and liquid nitrogen. What's the benefit of using gas? Diesel is emitting particles to vaporise liquid. You don't emit particles, number one. Number two, gas is not generating noise when it's turning from liquid form to gas form. In a diesel cold system in a truck, it's very noisy. For those who have a house close to an apartment close to a grocery store, it is very noisy to hear those trucks delivering at night. And the third one is that diesel is emitting a lot in terms of CO₂.

We have two solutions. One is nitrogen, liquid nitrogen for long transportation. The other one is CO₂ for local distribution. We have here an easy solution to substitute diesel use into very friendly products: liquid nitrogen and CO₂.

So here, the time is now, so there is no way to wait. There is a new business model for us which is to provide solutions to the transporting company and we are having a good answer to public demand which is no noise, no particles, no emissions. I would say it is simple. It is now. It is happening.

The third is hydrogen clean mobility. And what is interesting here is to understand; that it's not for the next ten years. It is for the next two years. Hydrogen is coming into play.

So, why it's happening in California? It is happening in California because out of the four elements, you have the first one which is public demand, policymakers, there is a system in California which is very stringent against those suppliers of cars with diesel and gasoline usage because they are emitting. It's called the zero-emission stage. And it's pushing companies like Toyota, Honda and others to come – and Tesla by the way – to come with electric cars. But if you want to use hydrogen to get running your hydrogen car, you need hydrogen.

So, what did we do here? We decided to make an investment. So, we can't just wait for the cars to be there because chicken and egg, the cars are waiting for us and we are waiting for the cars. So, what we do here at this investment is basically to break the time constraint and to make the decision. So, we are not making the decision based on the cars which are there but we are making the decision with the cars that will be there. And as you know, this investment can supply 35,000 cars with hydrogen.

So, what Air Liquide did is to say there is a business model for us because we are leveraging on our technologies – liquid hydrogen, transport of liquid hydrogen, storing liquid hydrogen, delivering and refilling the hydrogen in refilling stations that we have installed. So, we are leveraging on our technology. We are breaking this time constraint by going forward and we are satisfying the public demand and the policymakers.

So, out of the four elements, we have decided that in California, it is the time to go. So, the bottom point of this decision is that Air Liquide took the decision to invest before the cars come, which should make them come. It is an ecosystem in which you need to participate and bring your own contribution and in our case is the technology and the investment.

So, now, let's go to the next step, hydrogen global economy. Here, this is a graphic which comes from the Hydrogen Council which is giving a comprehensive way of the whole energy supply/demand. So, it's a much broader view. And what the Hydrogen Council has done is having all, those 56 partners imagine the world of tomorrow and to say first of all, if indeed there is a hydrogen opportunity in the world, we need to look at. Okay, how this hydrogen will be produced.

So, you have seen during the different presentations, there is multiple ways to produce hydrogen. Electrolysis is one of them but it needs renewable electricity. It can come from the wind or from solar energy. There is another option which is from natural gas with carbon sequestration, which has been explained. So, you can see also in this low-carbon society optionalities. And the more optionalities we have, the more likely it is going to happen.

So, here, hydrogen, different possibilities. And there is a fourth one which is that we can use biomethane to feed our SMR, our steam methane reformer, and to get here hydrogen which is without utilisation of natural resource, so without CO₂ emitted by natural resources. Okay, the first point.

The second, you have to imagine now new uses for liquid hydrogen. We can imagine a world where tomorrow, all these big tankers of LNG will be converted in big tankers in liquid hydrogen. And it's happening now. You have some Japanese companies who are developing those kinds of technologies.

The third one is buffer. Our energy sourcing system in the world is based on big buffers underground in caverns or in large storages in harbours. We'd have to invent globally – the world will have to invent buffering hydrogen, liquid hydrogen either in cavern or in storage but on liquid form most probably.

When you speak about markets, when I spoke about California, basically, the first one is transportation. This is one of the many markets we consider tomorrow can be addressed through hydrogen.

The second one is the industry energy. Today, industry needs a lot of energy which is carbon-based but you can have the same level of energy being hydrogen-based. The big difference is that any time you use carbon, you get CO₂ at one point. The big difference with hydrogen that if you take hydrogen, at the end, you get water. So, it's a major difference between the two products of course.

The third one is the cities. The cities will be also under big constraint about emissions, about particles. Today, we imagine a world where hydrogen could be a better choice both for heating, cooling also and power.

The second to last is feedstock. All the chemical companies today are filling on carbon-related products. But you can imagine that the feedstock will be a combination between hydrogen and CO₂. So, instead of emitting the CO₂ in the air, you collect the CO₂ for a chemical reaction with hydrogen to replace fossil feedstock in the production of hydrocarbon-based chemicals such as methanol and derived products.

And the last one that we are seeing more and more, I would say, important in the game is digital. Digital is the cloud; cloud needs servers; servers need a lot of energy, a lot of energy.

There are some projections today to say that in the next 20 years, it's very likely that digital which is today about 4%, 3.5% of the total energy can go up to 20%. So, all the GAFA of the world will have to demonstrate that despite the fact that they are more and more ingrained in our everyday life, they have to demonstrate they are CO₂ neutral. And we consider that hydrogen can be a solution here.

So, our vision in 2050 is that hydrogen could be a significant substitute to the regular carbon-based natural resource, 18% of the energy worldwide could be provided by hydrogen meaning that it would be basically 18% of CO₂ not being emitted mechanically. It will create a new business, back to the point which is absolutely critical for us is to make sure that all of this will be for us an activity, a business, 2.5 billion and 30 million job creation. So here, the vision of this hydrogen global economy is that it can be a significant player on the whole chain from production, transportation, utilisation. So, this is basically the last point I wanted to illustrate.

My conclusion is the following that as I told you before, all this low-carbon economy, you need to take into account all the stakeholders which we are not that active in that field, number one. And you have seen all the examples.

The second one is that if we don't cooperate, so if we don't have open innovation among all the players, it will not work. It will be a major restructuring of business models in which we have to acknowledge that different companies have to find their way.

And the last time – the last point is to make sure that collectively we manage the time accordingly and we introduce innovations and new business models along the way.

Thank you and let me hand over to Fabienne.

Fabienne Lecorvaisier: Thank you, François. Hello, everyone. So, I know you see me on stage and you think back to the numbers. The fun is over. Absolutely not. The fun is just starting.

After the Black Friday, we offer you the green Friday. What I am going to show you is that green can also contribute to your wealth and that the actions we take for climate are fully aligned with our financial objectives.

Let's start by the painful part, the spending. Yes, we spend and we invest to reduce our carbon footprint. It is a differentiation factor to our competitors and we are proud of that. Some of those investments already contribute today to the financial performance. Some don't – we recognise that. But we believe that they are absolutely key for building our future.

We spend approximately 100 million a year in innovation expense to develop solutions and to implement solutions to reduce carbon footprint. It's approximately half of our innovation expense.

The cumulated CAPEX we already spend for biomethane and hydrogen mobility are over 300 million as per today.

And we also decide for the future. 40% of the decisions for new projects that we took since the beginning of this year are embedding environment and climate objectives. And that of course includes the recent investment we announced for hydrogen mobility in California.

Now, let's talk about the contribution to performance. Yes, it does exist. I hope, yes, here we are. So, the contribution to performance comes through strong efficiencies but also through the expansion of our core business and through the opening of new markets.

Let's start first by the efficiencies. You know that delivering efficiency is one of the pillar of the NEOS objectives. We committed to deliver 300 million a year. Actually, since the beginning of the programme, we had been constantly over delivering and you need to understand that 20% of this efficiency comes from reduced energy consumption in our production units and 10% comes from the optimisation of the delivery routes that have been described to you earlier this morning.

So, it's 30% of those sustainable cost savings which are coming from our actions for climate. So, if you look at the total NEOS programme over five years, it represents 30% of total savings meaning €500 million of savings that will flow through the P&L thanks to this action.

Let's talk now about business development. And first, about the expansion of our core business. You heard a certain number of examples this morning. Here are the numbers. The hydrogen sales for de-sulphuring in refining represents today more than one billion contribution to our top line. The oxygen sales for oxy combustion either for blast furnace or for glass float represents more than €360 million. And you know that those examples are coming from large industry. Large industry is today the most profitable of our businesses. So, it is profitable additional business.

We also talked about electronics. And you will, in the booths upstairs, see a concrete demonstration of our new molecule, enScribe which has been just launched this year, already represents €20 million of sales and it will expand rapidly. Those businesses have an average growth of 6%, which is really at the top of the NEOS objective. So, it's among our best performers.

Then actions for climate also contribute to the opening of new markets. We described our initiatives in biomethane. The biomethane market today is probably around €3 billion. We believe that in 2025, it would be more in the 6 to 7 billion range. I would say biomethane represents €100 million sales today in 2018 and they grow by approximately 40% a year.

Hydrogen energy is a little bit more modest at this stage. But the potential, as reminded by François, is absolutely huge estimated by McKinsey to be at half a trillion in 2030. In this market, we only have sales by €30 million today. That's modest but we grow by more than 100% a year. So, these are only a few examples of how the climate initiatives can contribute to the current business and to the future business.

I would like to conclude – not too fast – by coming back to the Air Liquide ambition on the NEOS objectives that we presented to you in 2016 – lead our industry, deliver long-term performance, contribute to sustainability. Sustainability was already there. It just took us a little bit more time to precisely define and quantify our commitment. But I would like to insist that those objectives are not coming one on top of each other. They are completely embedded and completely compliant.

Benoît Potier: I think globally, you saw that it's a lot of small but significant actions that we will be taking. We've tried to be as good engineers as we could. So, we made all the technical calculations and the economical calculations to make it consistent. And what we have shown is really what we are going to do in the next nearly ten years.

I would just like also to add that the world will not end in 2025, hopefully. And that everything we said today will have a much longer impact in the years to come. So, we are already thinking about 2030 and 2050 and we talked about it in the hydrogen sector. But it means that things will not necessarily happen the way we think but they will happen. Our conviction today is that we have enough in our hands to make it happen.