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Hydrogen Production in Russia

Hydrogen Energy: Russia's Potential Economic Freedom

Russia has the biggest land mass of any country in the world, yet its population keeps shrinking every year. Their average household has about two to three people living in it, matching up to much smaller countries neighboring Russia like Norway, Poland, and Ukraine, who all have a similar number of persons per household (Population Research Bureau). The average adult in Russia earns about fourteen thousand USD a year (Statista). This classifies Russia as a poorer country compared to others near it, with an economy only slightly bigger than some U.S. states (Daily Reporter).

Throughout the early 2000s, Russia was identified as one of the fastest-growing economies in the world, with a GDP growth of at least four point seven percent each year from 1999 to 2008. From there Russia's economic growth slowed a little; from the years 2013 to 2018 their growth was much slower, partially caused by sanctions being put in place as a consequence of them invading Ukraine. Their GDP then fell three percent in 2020, but we saw another great rise in 2021, matching the likes of their growth in the early 2000s (Bloomberg).

Russia's abundance of space allows for much more to go on in the country. A large portion of Russia is used to mine and produce oil, which is one of Russia's biggest exports (The Global Economy). Russia provides about ten percent of the entire world's oil production (The New York Times). Oil production is not only a big export for them but a big import for many other countries. With a large percentage of Russia's economy being devoted to oil, there comes a danger of placing so much dependency on the money the oil production will bring in, which was about one hundred and ten billion dollars last year in 2021 (Statista).

We all know that much of the world is starting to look towards a more sustainable future, which means that the likes of fossil fuels, like oil, will soon be a thing of the past. Many places and countries around the world are developing sustainable ways to power their lifestyles, with solar energy, wind farms, electric cars, etc. These places are quickly becoming more popular and many other countries are also trying to move towards sustainable energy. This means a drop in fossil fuel usage, putting Russia's entire economy at risk if they do not find an alternative source of income to focus on. So what can Russia do to keep its economy alive when the world soon moves on? The answer lies in hydrogen fuel production.

Hydrogen fuel is a technology that is currently being researched and developed in many places around the world. Hydrogen fuel would be used instead of gasoline or energy to power cars. The only emissions coming out of a car with hydrogen fuel would be tiny drops of water (PBS). This technology would eliminate the carbon footprint that cars and trucks leave, and some scientists are hopeful that once we get more hydrogen cars, we can move on to researching how to put hydrogen engines in bigger vessels like freight trucks (Public Broadcast System).

Currently, there are a few main ways that hydrogen can be produced. The first is called Gasification. This is the process of using a gas made of elements like hydrogen, carbon dioxide, and monoxide to take the hydrogen. Then the gas is exposed to very hot steam, which separates the hydrogen readying it for harvest (U.S. Department of Energy). There is also Electrolysis, which is where an energy current is used to split water into hydrogen and oxygen. This process is a popular one and especially renewable if the energy produced is used in sustainable ways (U.S. Department of Energy). Several ways are in development such as High-Temperature Water Splitting and Photobiological Water Splitting. High-Temperature Water Splitting is when water is heated to a point where it splits into hydrogen and oxygen, it is a promising strategy but it needs a very very hot item to get it to warm up (U.S. Department of Energy). Photobiological is a little behind in development, but it is an impressive theory. Algae produce hydrogen when they consume water, so if scientists can further their research into how to harvest that hydrogen produced, Photobiological Water Splitting could also be a simple way to get hydrogen (U.S. Department of Energy).

Russia could focus on one of the more popular methods of extraction, electrolysis. Electrolysis can convert seawater into hydrogen energy. With this conversion, they can focus on turning Russia into a green country. With a partner with a major vehicle company, Toyota, Russia can look toward filling their country with hydrogen cars. A preliminary action the Russian government needs to take before implementing the hydrogen cars is installing hydrogen fuel stations. They could start by installing a few stations in a big city, like Saint Petersburg. An average refuel station costs around 1.9 million USD (U.S. Department of Energy), or 116,850,000 Russian Rubles to install. This would be the first step to implementing more stations and getting more stations available. The stations do not need to be manned, so after installment, they can be self-sufficient.

Toyota is a leading hydrogen car manufacturer at the moment (Toyota). It has one hydrogen model available: the Mirai. The Mirai is a hydrogen-powered sedan and has been on the market for seven years (Toyota). Last year two thousand two hundred and twenty-nine Toyota Mirai were sold globally, with a total of seventeen thousand nine hundred and forty units sold since they appeared on the market (Car Sales Base). Toyota is a big seller worldwide, and if Russia can provide them with the hydrogen they need for the Mirai and other future vehicles, this could be a big possible source of income for Russia. Toyota would benefit from this partnership because a large number of cars sold in Russia could push them to the front of the development of hydrogen energy and cars. This could mean more investors and opportunities for the Toyota company, thus creating incentives to work in collaboration with Russia.

An average gallon of hydrogen fuel costs sixteen dollars (Public Broadcast System), which may seem high, but if we put into comparison how quickly the average cost of a gallon of gasoline is going up, then sixteen dollars a gallon might not be that far away. An average of two hundred and ninety-seven million barrels of gasoline are sold in Russia each year (U.S. Energy Information Administration). That amount of Gasoline is not sustainable for a healthy country, and if we do not start integrating a more sustainable fuel source when fossil fuels eventually run out or we stop using them, many countries will have a hard time adjusting.

Another reason why a switch away from fossil fuels to hydrogen energy would be beneficial is for a lack of conflict. One of the main reasons why Russia constantly has conflicts with neighboring countries is

over the transport of oil. Russia's economy depends on getting oil to other countries, such as Germany. For this to happen, sometimes the oil has to pass through other countries on its way to its desired location, and this passage has caused some struggle with negotiations on how that transportation works. This led to short conflicts, which all could have been avoided if there was not a need to move the oil. These conflicts, such as the Ukrainian-Russian conflict, have affected the rest of the world, including the United States greatly. Most people's everyday lives have been disrupted by a conflict between two countries thousands of miles away.

The current conflict has led to multiple reactions and consequences. One event that has occurred because of the war is a sudden scarcity of wheat (NPR). One of the main ingredients in most foods, especially in the United States, both countries involved in the current war are big wheat exporters, so this sudden complication has led to a lack of that resource, which will soon lead to the scarcity of common foods like bread. Another headliner has been the rise in gasoline prices (CBS). We are seeing a major increase in the price of a gallon of gas, which can be hard for people trying to commute to work every day. This brings us back to the point that if the world was less reliant on these fossil fuels, a conflict not directing many people could cause fewer problems. If Russia frontlines this change, it might be influential enough to convince others to make the same change. A hydrogen fuel change could be not only beneficial for Russia, but the world as a whole.

With no longer a need to move oil through potentially worrisome countries, there will hopefully be less conflict with neighboring countries and Russia. With a lessening of conflict, more resources should become available to the rest of the world. One change in the world's largest country could have a heavy influence on the rest of us forever.

In conclusion, Russia's economy is reliant on an unstable, uncertain export. A country with one hundred and forty-four million people has an economic system built on an unreliable source of income, that causes much conflict with other countries that affect the rest of the world. Two countries' conflicts affect us all in the long run. With hydrogen energy production by way of electrolysis with the use of seawater, which they have an abundance of, Russian scientists can separate hydrogen from oxygen to use hydrogen energy and motors. With the production of hydrogen motors, Russia can move to hydrogen cars at a mass production level. With a partnership with Toyota, which has a huge factory in Saint Petersburg, they can work on producing a large amount of the model Mirai. This will severely cut down on the greenhouse gas emissions produced by Russia. A mass introduction of hydrogen cars will also pressure other countries to follow suit, hopefully bringing about a large change and a large cut down on the number of fossil fuels used on a daily basis. With many countries following suit in this big hydrogen energy revolution, Russia will be the leading hydrogen producer, leading to a substantial increase in their worth to the rest of the world, hopefully increasing the GDP of Russia while also moving a heavily oil-based economy, which is very competitive for the very dim future it has, to a virtually unchallenged promising trade and production of hydrogen for a hydrogen-powered future.

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