



## Decarbonization and Increased Self-Sufficiency – Two Major Objectives of China's Chemical Industry

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In the past few months, two major objectives have emerged that will contribute to shaping China's chemical industry – decarbonization and self-sufficiency. What do these two objectives mean? What is the relationship between them? May they even contradict each other? This paper aims to provide some answers.

Let us start with a brief description of both objectives and their implications for China's chemical industry.

Decarbonization is the reduction and eventual elimination of net carbon dioxide emissions. Primarily, this can be achieved by avoiding the use of fossil fuels such as oil and coal and instead using other power sources, e.g., nuclear, solar, wind or biomass. Xi Jinping has committed to clear decarbonization goals for China during the 75th United Nations General Assembly: a decline of carbon dioxide emissions from about 2030, and carbon neutrality by 2060.

For China's chemical industry, this will mean that by 2030, any increase in use of fossil fuels as chemical raw materials (e.g., due to increased demand for petrochemicals) will need to be compensated by a reduction elsewhere in China's economy. The potential defensive argument that a large share of the fossil fuel utilized by the chemical industry is not immediately turned into carbon dioxide (because it is converted into chemicals and materials such as plastics) will probably not be accepted by the general public, as these materials will eventually also be converted into carbon dioxide, for example when being incinerated at the end of their lifecycle. However, this is not true if the chemical materials are being recycled, allowing their reuse without creation of carbon dioxide.

In any case, the chemical industry currently only uses about 14–16% of global oil production and uses this input to create a value that is much higher than obtained

from oil on average. Thus, it is reasonable to assume that the 2030 date for peak carbon dioxide emissions will only have a limited impact on the chemical industry, especially if chemical companies will be allowed to improve their carbon balance in areas outside of the chemical industry. For example, a chemical company could invest into solar energy used as energy source for electric vehicles, and could subsequently use the oil saved in transportation for its chemical production.

In fact, according to a study by BP while the share of oil used as transportation fuel will peak in 2025 at about 58%, the share used to produce chemicals is expected to grow from 14–16% of oil demand in 2020 to 20% by 2040. This supports the argument that it will be more difficult to substitute oil as a chemical raw material than as a transportation fuel. While the technologies for shifting the majority of energy usage to hydrogen and batteries already exist, this is much less the case



for replacing chemicals and plastics by biomass.

Increased Self-Sufficiency in chemicals means reducing China's dependency on imports of chemicals, particularly in areas that are regarded as strategic. Specifically, the "14th Five-Year Plan Development Guidelines for Petroleum and Chemical Industry" recently issued by the CPCIF aims to achieve a 75% self-sufficiency for new chemical materials by 2025.

To what extent are the two objectives of decarbonization and self-sufficiency correlated? Might they even contradict each other, as some financial analysts suggested to me?

The two objectives differ in a number of dimensions, as shown in Tab. 1.

First, obviously the two objectives have different central goals – the reduction of carbon dioxide emissions for one, the reduction of import dependency for the other. As a consequence, the core subject matter of decarbonization is the amount of fossil fuels (primarily oil and coal) used, with some potential corrections for new technologies such as carbon dioxide sequestration. In contrast, the key subject matter for the increase in self-sufficiency is the amount of chemicals imported.

Another major difference is in the timeframe for achieving both objectives.

Decarbonization is a long-term goal – in

fact, China's commitment to peak carbon dioxide emission by 2030 means that until then, the amount of carbon dioxide emitted by China very likely will increase rather than decrease. Only after 2030 and over a period of 30 years will China aim to achieve zero net carbon dioxide emission.

In contrast, the increase of self-sufficiency for chemicals is a much more acute goal, as it is linked to very current developments such as the trade conflict with the USA. The first milestone of achieving 75% self-sufficiency in high-end chemical materials is already set for 2025, with a further increase in self-sufficiency likely targeted within the

Tab. 1: Comparison of decarbonization and increased chemical self-sufficiency across different dimensions

Dimension	Decarbonization	Chemical self-sufficiency
Key goal	Reduce carbon dioxide emission	Reduce import dependence
Subject matter observed	Consumption of oil and coal (with potential corrections for technologies such as carbon capture)	Chemical production, particularly chemical imports (with a focus on high-end materials)
Timeframe	Primarily long-term (10-40 years)	Primarily short-term (5 years)
Role of chemical industry	One actor of many	Main actor
Action required from chemical industry	Reduce or eliminate use of oil as raw material, or find ways to compensate	Increase R&D and production in those chemical segments for which China depends strongly on imports
Role of China vs. World	Cooperative: China as an important actor among others, aiming to achieve a common goal	Competitive: China as an actor in a competitive world, aiming to achieve its own goal



period of the subsequent Five-Year Plan.

The increase in chemical self-sufficiency is a relatively narrow goal that is very specific to the chemical industry, which will necessarily be the main driver. In contrast, decarbonization affects a much broader range of industries, including big emitters such as transportation, steel and cement. In fact, given the important role plastics and other chemicals play in the modern world, and the difficulty of replacing them, one could reasonably argue that the chemical industry is likely to be the segment least affected by decarbonization, and the segment that – due to the huge value created by these chemicals – will find it easiest to finance compensating mechanisms, or mechanisms to eliminate carbon dioxide from the atmosphere.

Nevertheless, the chemical industry may be affected by decarbonization by being forced to reduce its use of its current main raw material, oil, and to replace it by renewable resources such as chemicals derived from plants. In the long run, this may completely change the big established chemical value chains, which currently primarily start from oil (and in China, to some extent from coal).

In contrast, increasing chemical self-sufficiency will mean that the domestic chemical industry will need to increase its efforts to develop and produce those chemical materials that are currently imported – in effect, this will mainly mean an effort in R&D and the subsequent production technologies.

Finally, both objectives indicate different roles of China in the global community. China's commitment to decarbonization was widely praised internationally. For example, Thom Woodroffe of the Asia Society stated that "Xi's commitment to achieve carbon neutrality before 2060 is a gamechanger ... For the first time ever there is now a clear long-term trajectory for decarbonization in China." In other words, in its decarbonization efforts China pursues a goal that is identical to that of most of the Western world – the slowdown of global warming. Any measures taken by China do not only benefit the country, but also the whole world. In contrast, the objective to achieve greater self-sufficiency in chemicals is one for which China has the role of one of several competing states.

Do decarbonization and increased self-sufficiency contradict each other? As I hope to have shown above, the correlation

between the two objectives is much less straightforward. While both are government policies, they have rather different imperatives and timelines. Increased self-sufficiency is an objective that the domestic chemical industry can easily embrace and that – in part due to its short timeline of a few years only – is likely to be a major priority of R&D and investment. In contrast, decarbonization is difficult to align with the interests of the industry as oil is a valuable and very difficult to replace feedstock, but the long timeframe of this goal along with the modest contribution of the chemical industry make this a much less pressing goal for the chemical industry that can be pursued by a certain limited level of long-term R&D on the use of sustainable raw materials as chemical feedstock.

In some way, it may well be argued that decarbonization will increase China's self-sufficiency. Currently, China relies on imports for about 70% of its oil consumption. Thus, any substantial reduction in domestic oil consumption will most likely primarily lead to a reduction in oil imports rather than in domestic oil production, thus increasing China's self-sufficiency. ■