
Back to 2050
1.5°C is more feasible than we think.
Life Is On
Schneider Electric

Executive summary

On August 9, 2021, the Intergovernmental Panel on Climate Change issued the first chapter of the highly anticipated 6th assessment report, fully due in 2022. The conclusions are clearer than ever: global warming is man-made and the window of opportunity to change the course on which the world appears to be set on is closing rapidly. The UN Secretary General Antonio Guterres called this report a “Code Red for Humanity”. The target is clear. To keep global warming limited to 1.5 degree (compared to preindustrial levels), carbon dioxide emissions must be zeroed by 2050, and reduced by 30-50 percent by 2030 (while other greenhouse gas emissions must also be significantly abated). The bulk of these emissions comes from energy. A transition toward a net-zero economy is thus also an energy transition of momentous proportions. The pace and extent of its unfolding has simply no precedent in history: it has to happen within a time frame twice shorter than in the past, and on a global scale.

How this can realistically be achieved is thus the main question, and despite a flurry of scenarios to 2050, the momentum is still not here. In fact, 2021 will mark a major rebound in global emissions, as the economy recovers from the Covid-19 pandemic. Yes, nothing has really changed yet.

This report is another contribution to this question and proposes an alternative approach. It builds on key findings from the study of past energy transitions. History indeed reveals that what drives energy transitions is actually the way this energy is used and consumed. Energy transitions happen because new energy resources bring about positive changes in consumption patterns, or because new consumption patterns emerge and call for innovations in energy use. **Energy supply has always chased energy demand**. What this means is that the only way to realize a transformation of the energy system of such magnitude is to design a transition which makes sense for the consumer, hence drive adoption – rather than resistance – at an accelerated pace.

This is what we have done. And our conclusion is clear: **the best way – not to say the only way – to get to net-zero by 2050 is to modernize the economy at rapid pace, building upon innovations and behavioral changes** that – for many of them – will support the climate change agenda, although not always rapidly enough, and that – for some of them – need to be closely watched and possibly mitigated. **There is no needed arbitrage between human progress and climate change mitigation. In fact, there will be no climate change mitigation if it does not build on human progress**.

Would someone have imagined back in 1990 (30 years ago) that half the global population would today walk in the streets with 100,000 times the computing capacity of the guiding system that landed Apollo 11 on the Moon in 1969? How does this inform us about what to expect for 2050 (30 years down the road)? Yes, in 2050, we will live in a different world. In this report, 12 key transformations have been reviewed and their impact on the energy system modelled. These key transformations are all largely inevitable, as they bring considerable benefits to consumers, in terms of access to services, convenience, and quality of life.

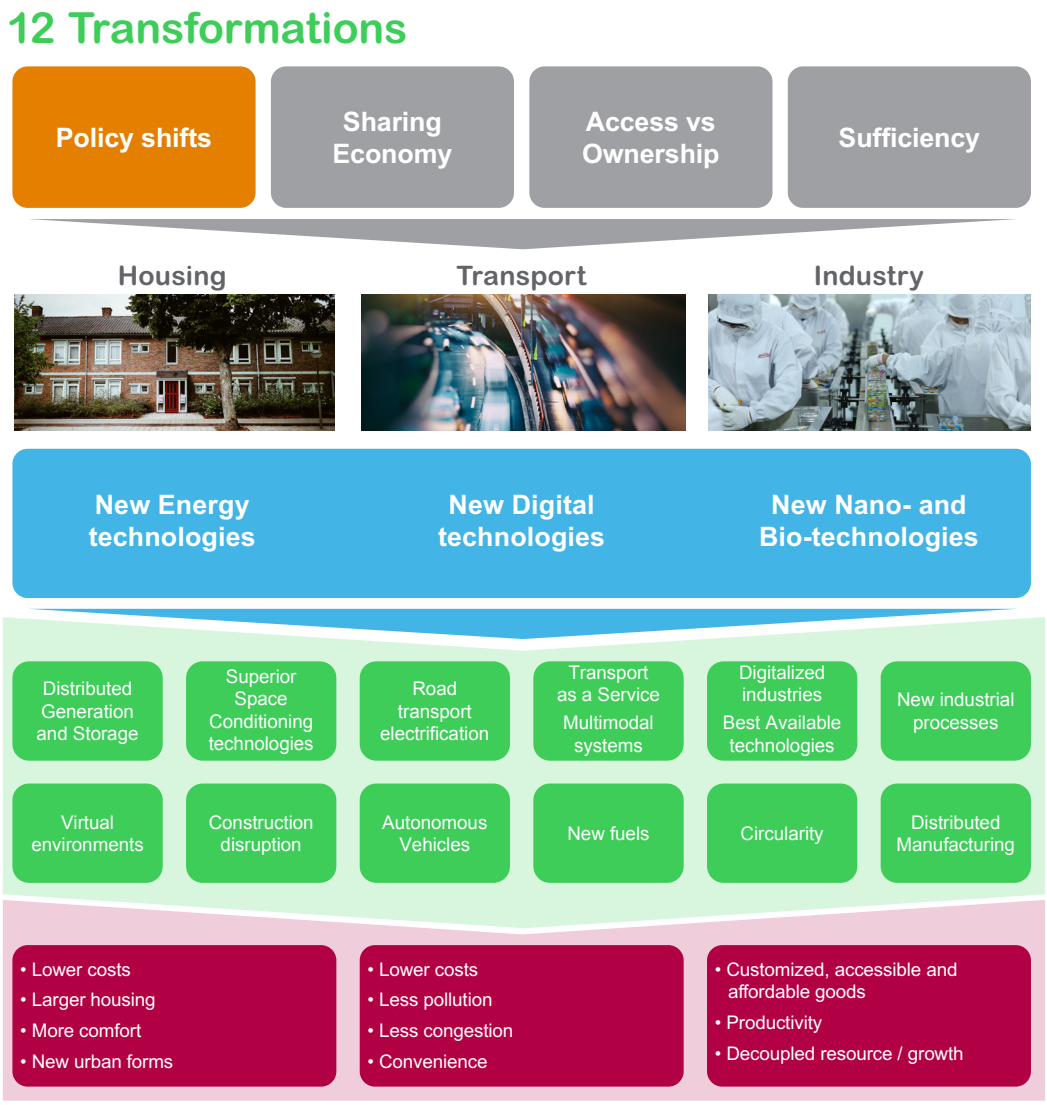

Figure 1 – 12 transformations to 2050

The only question is the pace and the extent of their unfolding by 2050. Two scenarios have been modelled

- The scenario *"New Normal"* essentially looks at the natural unfolding of such transformations in consumption, without further policy changes, and considering business as usual market conditions.
- The scenario *"Back to 2050"*, central to this report, explores to which extent a "climate & consumer-centric" policy shift can help reach the target of cutting emissions by 30-50 percent by 2030, on a course to net-zero by 2050.

The key finding of this detailed modelling is that **a pathway to 1.5-degree is more feasible than we think**. In the *"New Normal"*, we find that the economy, as it modernizes, becomes less carbon intensive and decarbonizes faster than often anticipated, albeit not at the right pace. By 2050, emissions in this scenario drop 30 percent compared to current levels (no additional policies).

Accelerating these positive transformations of consumption, in other words accelerating modernization thru a consumer-centric policy shift, helps reach a net-zero economy by 2050 (scenario *"Back to 2050"*).

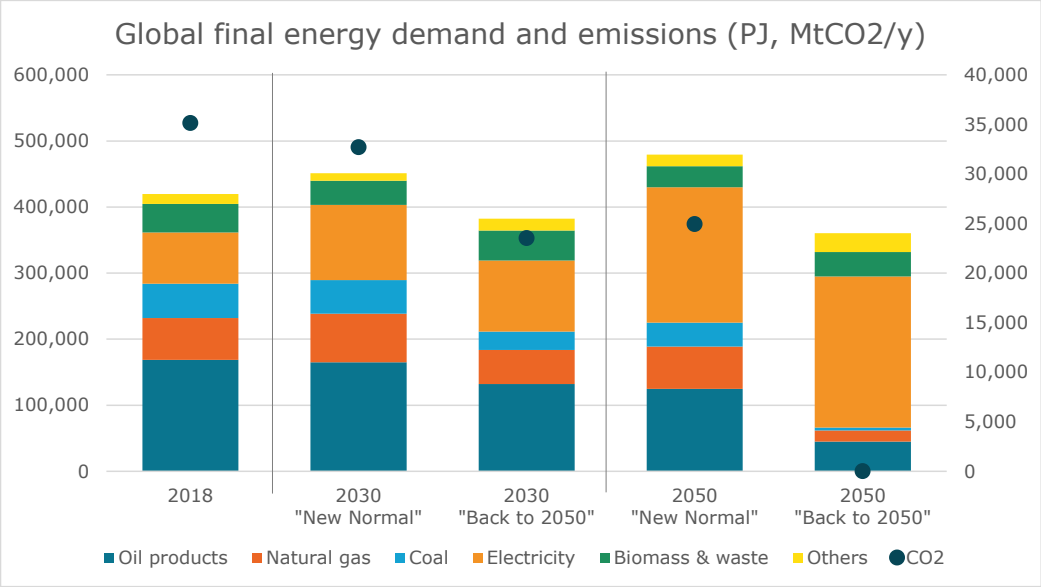

Figure 2 – Global final energy demand and emissions across 2 scenarios

Final energy demand in this scenario drops 15 percent compared to current levels. It stabilizes in urban environments but drops 20 percent industry and over 30 percent in mobility. The energy system also electrifies, with a share of electricity which climbs from 18 percent (in 2018) to 60 percent by 2050. Total electricity demand increases 3 times, and 20 percent of it is actually delivered by distributed solutions. The share of electricity reaches 80 percent in buildings and industry, and 40 percent in mobility: a different world.

Net carbon emissions are reduced 30 percent by 2030 and zeroed by 2050. In 2050, there are still 5,500 million tons of annual residual emissions, which are compensated by Carbon Capture, Utilization and Storage (CCUS) and other negative emission solutions (Direct Air Capture, Nature Based solutions)[2].

Deep sectorial view		2018	2030	2050
Global	**Final energy demand (PJ)**	**419,756**	**382,353**	**360,558**
	Electricity demand (TWh)	**21,564**	**29,912**	**63,528**
	Share of electricity	**18%**	**28%**	**63%**
	Net CO2 emissions	**35,152**	**23,531**	**0**
New urban environments	Final energy demand (PJ)	128,012	112,159	127,725
	Electricity demand (TWh)	11,762	16,106	28,853
	Share of electricity	33%	52%	81%
	CO2 emissions (direct + indirect)	9,661	5,529	219
	CO2 emissions (direct only)	2,985	1,543	210
New mobility patterns	Final energy demand (PJ)	117,186	107,912	82,608
	Electricity demand (TWh)	302	3,043	9,684
	Share of electricity	1%	10%	42%
	CO2 emissions (direct + indirect)	8,167	7,216	1,323
	CO2 emissions (direct only)	7,995	6,463	1,320
New industrial world	Final energy demand (PJ, without feedstock)	127,892	116,242	103,847
	Electricity demand (TWh)	8,873	9,813	23,386
	Share of electricity	25%	30%	81%
	CO2 emissions (direct + indirect)	14,952	9,170	1,635
	CO2 emissions (direct only, with process, with CCUS)	9,916	6,741	1,628
Other demand	Final energy demand (PJ)	46,666	46,039	46,378
	Electricity demand (TWh)	627	950	1,605
	Share of electricity	5%	7%	12%
	CO2 emissions (direct + indirect)	2,373	1,621	-366
	CO2 emissions (others: direct only, with CCUS)	2,017	1,385	-367
Power generation	Power generation (TWh)	24,675	35,833	74,155
	Distributed generation (TWh)	50	3,000	16,000
	CO2 emissions (power generation, with CCUS)	12,240	7,403	20
Negative emissions	CO2 emissions (other negative emissions, no CCUS)	0	-5	-2,811
	CO2 emissions (total negative emissions, with CCUS)	0	-305	-5,625

Figure 3 – Deep sectorial view

2 The scope of emissions reviewed in this report covers energy-related emissions and industrial process emissions, or a baseline of around 35,000 million tons of carbon dioxide per year.

In the route to net-zero (scenario *"Back to 2050"*), **the decarbonization of demand accounts for half of global abatement**, with supply decarbonization (notably power generation) accounting for the rest. On the demand side, the effort is almost equally split between demand optimization (changing consumption patterns) and process changes (which include notably the electrification of the energy system).

Demand optimization includes behavior transformations such as sufficiency in buildings, modal shifts in transport, circularity and the impact of other sectorial transformations, as well as energy efficiency measures on the stock. Process changes include the electrification of mobility, building and industrial heat, as well as the switch to other fuels, and the deployment of carbon capture, utilization and storage (CCUS), although the latter has a relatively minor impact compared to others.

More importantly, these transformations of demand come at net benefit for consumers, bridging climate change mitigation and human progress.

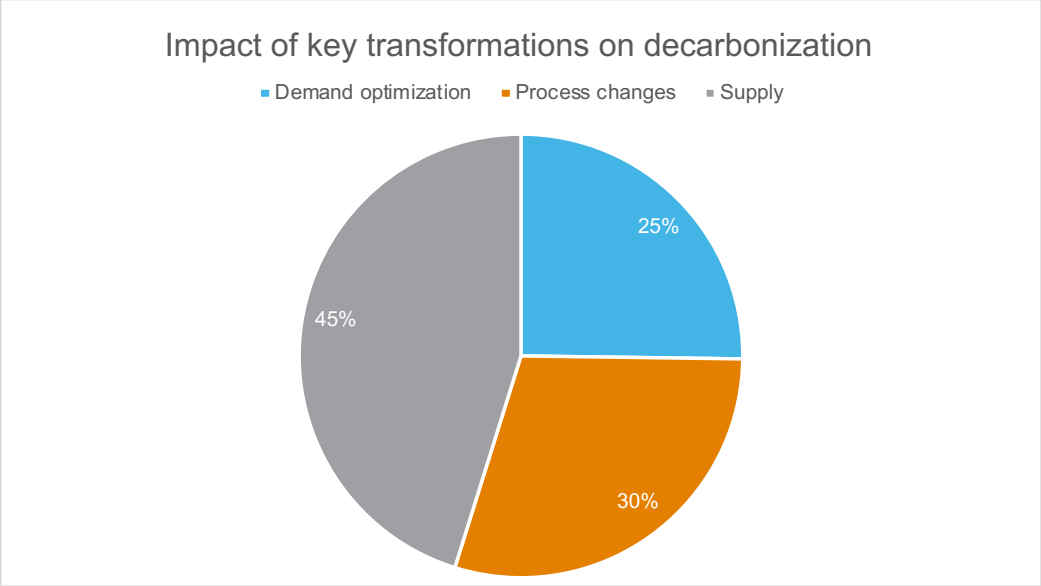

Figure 4 – Impact of key transformations on overall decarbonization, scenario *"Back to 2050"*

The accelerated modernization of urban environments, mobility patterns and industrial footprints thus charts a feasible pathway to a 2050 net-zero economy. As this transition is also consumer-centric, hence inclusive, we argue this pathway is also more realistic. Rapid adoption of decarbonized uses can only happen if it comes with human progress. Technologies, innovations and changing behaviors all make this possible. The key question therefore is whether the roadblocks to an accelerated adoption will be removed in time, or not.

In fact, a policy shift is required, from a pure “infrastructure-centric” focus to a complementary “consumer-centric” focus. This policy shift is not meant to discard the necessary and fundamental effort on infrastructure buildup, but rather complement it with key measures that will unlock a rapid and inclusive decarbonization of the economy on the consumer side. It is based on 3 pillars

- **Disrupt the inertia of the current system**: everything that is built new should now be built with the 2050 end-game in mind. There is no time for keeping up with the historic model. Policies can play a fundamental role in forcing these shifts, faster than it would otherwise pervade the economy.
- **Repair the existing**: a massive effort is required to modernize the existing stock of assets (buildings, mobility, industrial facilities and machines, etc.), at a much faster rate than natural evolutions. In fact, as 100 percent of the stock needs to be refurbished by 2050, the annual rate of renovation must increase by an order of magnitude compared to current levels (when accounting for those renovations that truly focus on deep decarbonization). Policies will also play a fundamental role in enabling this turnaround quickly.
- **Build up the twenty-first century energy backbone**: a fundamental effort is required to expand and strengthen the current power system infrastructure, in particular the grid. This is notably a critical point for new economies which will at large define the global trajectory toward zero emissions post 2030. This infrastructure also needs to take stock of the new paradigm of a more distributed energy landscape, where the grid effectively acts as a platform on which all other transformations build up. Finally, this transformation of the energy infrastructure must go along with a fundamental redesign of energy markets, which are today built for a fossil fuels economy.

The COP26 of November 2021 is in this regard a critical milestone. By 2022, a major overhaul must take place, with a no-regret move away from coal, stringent standards on new build, clear renovation programs at regional level, and a fundamental rework of market design.

Back to 2050

Accelerating the modernization of the economy to get to net-zero

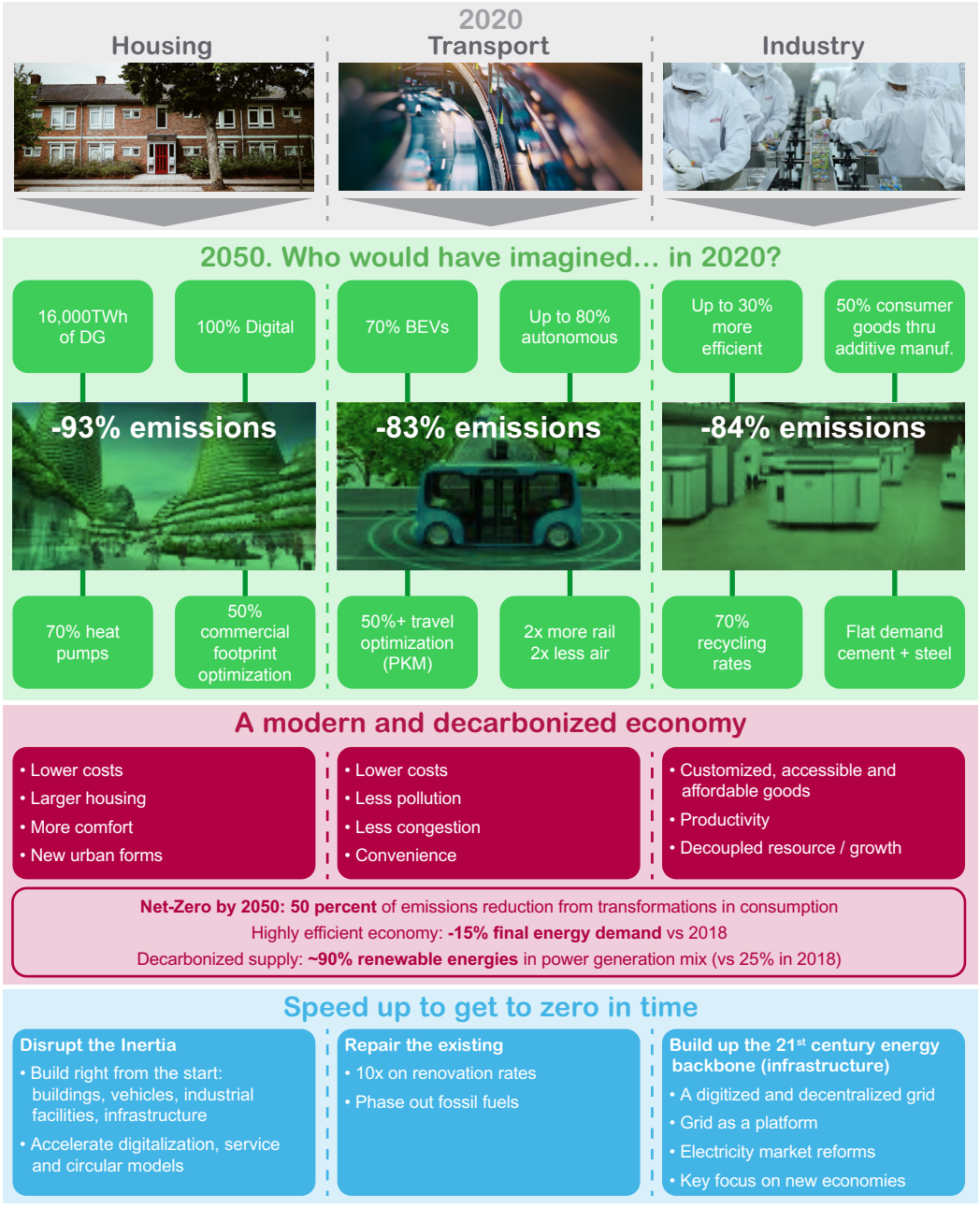

Figure 5 – Back to 2050, a scenario to net zero by 2050

If done right, a net-zero economy is achievable by 2050, and with it will also come human progress. It requires however to embrace the future with clear resolve. We acknowledge that many uncertainties remain on the pace and extent of such developments, and that more work is required to further refine some of the assumptions taken. This is also why we have tried to provide maximum transparency on this work, so that its underlying assumptions can be further debated. After all, scenarios are as good as their assumptions. We hope nevertheless that this effort will help steer the conversation toward the consumer side of the energy system and provide new insights to all those who focus on building practical pathways to our common goal.