

Contents

1. Context 2
 2. Criteria and mechanisms 3
 3. Lessons from last time 6
 4. Power 7
 5. Transport 13
 6. Buildings and industry 16
 7. Industrial digitalization 22
 About us 25

Green Stimulus: Life, But Not As We Know It

The Covid-19 pandemic appears on track to trigger an economic contraction more severe than the 2008-09 financial crisis, perhaps even worse than the Great Depression. Yet amid great uncertainty, there are known knowns: post-lockdown life will be different from what came before; the specter of climate change will remain; and governments will do their best to revive floundering economies through stimulus policies. But which specific ideas can most effectively drive clean growth? BloombergNEF examines the best opportunities across the power, transport, buildings and industrial sectors.

\$40B

Green stimulus announced to date

\$18.5B

Support for carbon-intensive sectors – with green conditions

\$555B







Support for carbon-intensive sectors – without green conditions

- Under our definition, effective green stimulus should: be ready for quick roll-out, provide value for money, create jobs, increase private-sector consumption and participation, contribute to CO2 cuts, improve resilience and fit government budgets.
- New green stimulus should not be anachronistic and not seek to rebuild the world of 2019. It should recognize that consumption, commuting and other patterns of human behavior have changed, potentially permanently. New policies should be crafted with a new reality in mind.
- The 2008-09 green stimuli offer key lessons for governments today: keep policies simple to mitigate bottlenecks; be realistic about leveraging risk-averse private capital; oversee funds scrupulously to limit waste, fraud and abuse; and manage public expectations when possible.
- In 'shovel-ready' terms, 387GW of wind/solar projects have permits in hand and are ready to advance globally. To expedite, governments can accelerate, expand or implement tenders for power-delivery contracts, renewable portfolio standards, tax credits, or other policies.
- Distributed PV has taken a hit from the pandemic and policy-makers can respond by expanding incentives or public procurement, or by cutting red tape. South Korea, Italy, Switzerland, Portugal, and Massachusetts have already responded with new support efforts.
- Utility-scale and behind-the-meter batteries make key contributions to meeting increasingly spikey power demand. Governments can reward batteries more by providing bonus dollars, renewable energy certificates or tax credits for discharging at important hours of the day.
- Training programs, as Germany and Spain have planned, can transition workers away from legacy areas of power (coal) toward new energy jobs. Such programs must provide workers with all the skills and knowledge they need to succeed, however.
- Electric vehicles are approaching cost parity on a total cost of ownership basis in a number of markets and green stimulus must ensure they don't lose momentum. EV purchase subsidies and scrappage schemes can help, as can attaching 'green strings' to automaker bailouts.
- Public-procurement programs can tackle one of the biggest barriers to EV deployment – lack of charging infrastructure. Governments can also invest directly in local manufacturing capacity for EVs and batteries, which are expensive and tricky to transport.
- 'Active mobility' incentives can make it cheaper and easier for commuters to walk, bike or scoot. This can alleviate pressure on roads that will otherwise be caused by commuters avoiding public transport due to Covid-19.
- Energy-efficiency programs for buildings can be rolled out relatively quickly to create jobs. To ensure timeliness, public-procurement programs could renovate state-owned buildings, while a pipeline of retrofits for private buildings can be incentivized through grants and loans.

Victoria Cuming

- Policy makers could tackle the growing challenge of waste management by incentivizing companies to build industrial composting, anaerobic digestion, or recycling facilities. These can be rolled out relatively quickly, would create jobs and avoid methane emissions.
- Not all stimulus for industrial digitalization will be green, but governments can invest in smart-grid technologies to cut costs and facilitate decentralized energy systems. They could also address the growing need for training and upskilling of workers in digital technologies.

Figure 1: Green stimulus ideas to respond to the Covid-19 pandemic

<p>Power </p> <ul style="list-style-type: none"> → Accelerate deployment of wind, solar and battery storage → Train fossil-fuel workers in green technologies → Procure small-scale solar-plus-storage for public buildings → Pay communities to promote acceptance of large projects 	<p>Transport </p> <ul style="list-style-type: none"> → Expand EV purchase incentives to accelerate cost-competitiveness → Fund a EV charging infrastructure build-out, and new EV and battery manufacturing capacity → Make it easier and cheaper for citizens to walk, bike and scoot → Include green conditions on support 	<p>Energy efficiency </p> <ul style="list-style-type: none"> → State procurement programs to renovate public buildings → Financial incentives to promote retrofits of privately owned buildings → Training and certification on efficiency to ensure high-quality project delivery
<p>Heating </p> <ul style="list-style-type: none"> → Pay households to swap oil-fired boilers for heat pumps → Incentivize lower-temperature industries to switch to electric heating → Introduce fiscal incentives for renovation works required to make buildings 'heat-pump-friendly' 	<p>Low-carbon fuels and circular economy </p> <ul style="list-style-type: none"> → Accelerate funding for planned CCUS and renewable hydrogen projects → Offer financial incentives for utility-scale digesters → Procure or incentivize new industrial composting, anaerobic digestion and recycling facilities 	<p>Industrial digitalization </p> <ul style="list-style-type: none"> → Invest in smart grid and in-field digital technologies → Create training programs on digital technologies → Provide funding to subnational governments for smart-city technologies

Source: BloombergNEF

1. Context

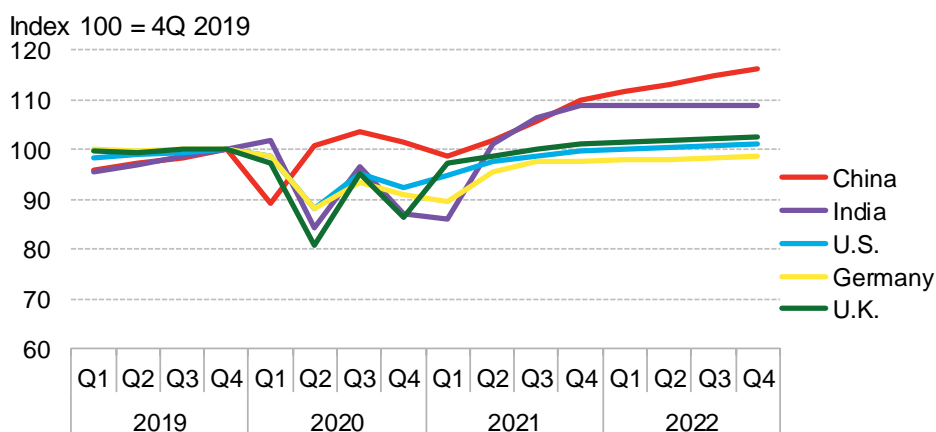
Governments around the world have announced trillions of dollars in financial support for companies and individuals since the start of the Covid-19 pandemic. The vast majority sought to tackle the most immediate effects of the crisis by providing wage subsidies, along with support for healthcare and aid to vulnerable households.

With the immediate fallout from the crisis now at least somewhat addressed in many countries, policy makers have begun to contemplate stimulus measures to revive flagging economies longer term. With global GDP due to contract 3% in 2020, according to the International Monetary Fund, the global economy is now on track for a retrenchment far more severe than the 2008-09 financial crisis and potentially worse than the Great Depression. Under BNEF's 'Multiple-wave pandemic' scenario, economic growth only returns in 2Q 2021 (Figure 2). However, amid enormous uncertainty, there are a few 'known knowns':

1. Post-lockdown, *life will be life, but not as we know it* (to paraphrase a line often mis-attributed to *Star Trek*).
2. Governments and industry will still need to cut greenhouse-gas emissions and adapt to the effects of climate change.

The pandemic has affected all areas of the economy and people’s lives,¹ and many of these changes look likely to be long-lasting, potentially even permanent. Smart stimulus should not seek to rebuild the world as it was in 2019, but rather it should take into account new realities.

Figure 2: Quarterly GDP forecast for selected countries under BNEF Covid-19 Scenario 2 (Multiple-wave pandemic)



Source: BloombergNEF. Note: For explanation of BNEF Covid-19 scenarios, see: Covid-19 Green Policy Tracker ([web](#) | [terminal](#))

When it comes to transport, for instance, as the pandemic eases it seems inevitable that more people will work from home more often, and place-based education could at least partially be replaced by remote learning. Concerns about further spread of the virus and measures to enforce social distancing will spur some commuters to drive or take a taxi, and others to switch to low-carbon options such as cycling or walking. Expanded use of private cars and taxis would increase traffic congestion and hurt air quality while damaging revenues for public transport operators. The next round of stimulus should take these new concerns into consideration by, for instance, not assuming the same number of citizens will agree to cram into subway cars at peak commute hours.

As for the second point, the continuing specter of climate change, the coronavirus and associated lockdowns have certainly caused cuts in CO2 emissions, particularly from airlines. But these are likely to be temporary without significant energy-efficiency gains and changes in consumer behavior.

As environmental groups, citizens and some businesses have called on governments to use longer-term stimulus packages to drive climate action, policy-makers have devised new schemes. Some of these are entirely new ideas while others take inspiration directly from actions taken after the 2008-09 financial crisis. This Research Note highlights efforts to date we regard as potentially most impactful, provided they are implemented in the right places in the right ways. We focus on four main sectors – power, transport, buildings and industry – which together accounted for some 82% of global greenhouse-gas in 2017.

2. Criteria and mechanisms

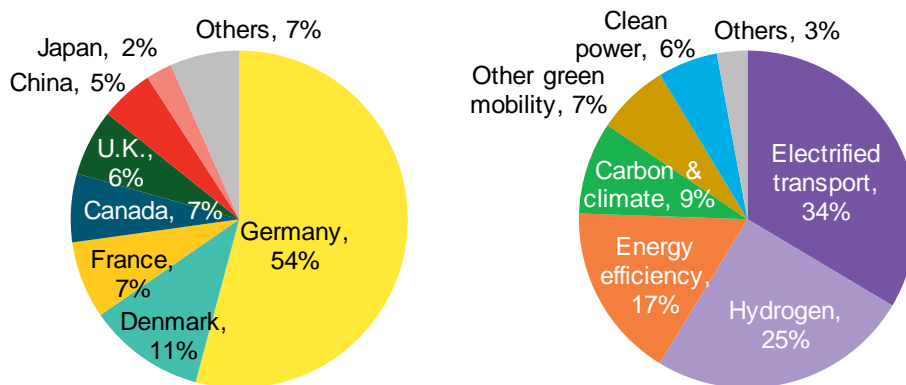
This Note uses five criteria to evaluate potential green stimulus measures:

¹ BNEF is tracking the impact on (among other areas) power, transport, oil & gas, carbon, materials, sustainability, metals and the circular economy. All related content can be found on the Covid-19’s Global Impact theme page ([web](#) | [terminal](#)).

- **Economic impact:** Effective green stimulus should deliver maximum economic impact. They should protect and create jobs, boost private-sector consumption and, whenever possible, leverage private investment. Most importantly, they should provide value for money – the biggest ‘bang for the buck’.
- **Timeliness:** Stimulus should be timed to take effect when most needed. Too slow and stimulus fails to prevent output and income declines. Too fast and it can potentially over-heat an economy already in recovery, increasing inflation and wasting public monies.
- **Green²:** Stimulus must cut future greenhouse-gas emissions or otherwise contribute to mitigating climate change. Conversely, and obviously, green stimulus does not in any way provide support for legacy fossil fuels to boost their economic competitiveness.
- **Resilience:** Stimulus should improve a jurisdiction’s ability to anticipate, withstand and react quickly to crises. The primary focus is, of course, climate change but could also include resilience to the current pandemic or to other unexpected events while adapting to new circumstances.
- **Limited:** Stimulus should be implemented just long enough to create certainty and stability for new sectors but should avoid blowing holes in government budgets longer term. Over-spending or over-implementation can balloon government deficits and prompt backlashes from the public or from buyers of government debt.

Governments have begun to announce green stimulus measures, which we track in the *Covid-19 Green Policy Tracker* (Issue 2, [web](#) | [terminal](#)). By June 9, 2020, 16 countries had announced \$40 billion of green support (Figure 3), and another \$18.5 billion has been allocated for carbon-intensive sectors, provided they achieve certain green goals.

Figure 3: Green stimulus announced by June 9, 2020



Source: Government announcements, media reports, BloombergNEF

We consider four principal categories of fiscal stimulus mechanism (Table 1), although there can be overlap between them. In theory, lower taxes, financial incentives (eg, grants or cash transfers) or increased government spending boost people’s and companies’ disposable income to be spent or invest. The resulting higher demand creates more jobs and additional competition for labor, raising wages and thereby also increasing disposable income.

The impact of a stimulus measure in practice will vary across markets, depending in particular on the existing level of public debt and financial market conditions, Different mechanisms will also

² Green stimulus differs from green policies: they both should have green potential; but the former should also have economic-stimulus potential – indeed their implementation is precipitated by an aggregate demand shock. Green policies are not intended to directly stimulate the economy; they can take time to have an impact on the market; and they are often intended to have a longer-term effect.

vary in the scale and duration of impact. Broadly speaking, increased government spending generally has a larger impact on economic output in the short run compared with tax incentives.³ This is because consumers may opt to save some of the money generated by reduced taxes, rather than spending it. Fiscal incentives also have a delayed effect as they feed through indirectly to the economy via consumption expenditure. For this reason, they may also be less timely than, say, financial incentives. This also applies to government investment in large infrastructure projects unless these are ‘shovel-ready’ or involve repair and maintenance. However, public-sector spending and financial incentives often have a bigger impact on government budgets than tax breaks.

Table 1: Principal fiscal stimulus mechanisms

Mechanisms	Description
Government spending	Direct government investment in green technologies and projects (especially infrastructure) or procurement of low-carbon goods and services (eg, EV purchases for government use)
Financial incentives	Subsidies for green technologies and activities – eg, grant and loan programs, loan guarantees, discounts, performance payments
Tax incentives	Reduced taxes for green technologies, or increased taxes on non-green technologies
Labor market measures	Policies to create jobs. Active measures = eg, direct job creation, hiring incentives, training programs, spending on public employment services Passive measures = related to income maintenance
Green conditions on stimulus support	Environmental obligations or mandates on companies receiving economic stimulus support

Source: BloombergNEF

Table 1 also includes economic stimulus packages that require recipients to fulfil green conditions. For example, some automakers had to commit to higher efficiency standards in the last financial crisis in order to receive support from the U.S. government. Several such announcements have been made in response to the Covid-19 crisis. Subsequent sections refer to these measures but they are not the focus of this note. See the box below on carbon pricing.

Carbon pricing

Strictly speaking, as carbon pricing is not public spending or tax breaks, it does not constitute fiscal stimulus – and is therefore not the focus of this note. However, there have been calls for government to use their recovery plans to implement or increase a carbon-pricing mechanism, in order to avoid a ‘brown’ recovery and locking in fossil-fuel dependence for longer.

While a carbon price is likely to be required for an effective decarbonization strategy, such a proposal would spark substantial opposition from industry, especially during an economic downturn. Yet, as is the case with most emission-trading schemes or carbon taxes, it would be possible to start slowly and soften the blow, for example, through free or subsidized allowances, fixed prices or pricing caps. Some concessions could be funded by reducing fossil-fuel subsidies, which still amount to billions of dollars a year.

The government itself could earn revenue through permit auctions or a carbon tax: the U.K. could generate 15 billion pounds (\$19 billion) a year, if it were to increase the current carbon price support from 18 pounds (\$23) per metric ton to 50 pounds (\$63), rising to 75 pounds (\$94) by 2030.⁴ The price support is due to remain at 18 pounds until 2022. This revenue could

³ International Labour Organization, A Review of Global Fiscal Stimulus, EC-IILS Joint Discussion Paper Series No 5, 2011.

⁴ LSE and University of Leeds, Pricing Carbon During the Economic Recovery From the Covid-19 Pandemic, May 2020.

then be reinvested as government stimulus through public-procurement programs or financial incentives.

The main impediment is timeliness, as carbon-pricing schemes take many years to design and implement, although in many respects a tax is less complex. Government should therefore focus on accelerating planned programs, making existing schemes more ambitious, and replicating mechanisms that have proved effective elsewhere. For example, Germany could bring forward its national emissions trading scheme, which is due to start in 2021 and will cover building heat and road transport (which are not included in the EU ETS). It could also increase the proposed starting price: at 25 euros (\$28) per metric ton of CO₂e, rising to 65 euros (\$74) by 2026, it will do little to spur heat pump or EV deployment. A price in the order of 110 euros (\$125) would be required to improve the economic viability of heat pumps. For more detail, see: *German Heat Pumps Viable at 110-Euro Carbon Price* ([web](#) | [terminal](#)).

In the short term, governments are more likely to delay or weaken carbon-pricing programs, to alleviate the burden on industry during a recession. We have already seen several such announcements, as discussed in the latest Covid-19 Green Policy *Tracker* ([web](#) | [terminal](#))

3. Lessons from last time

In response to the 2008-09 financial crisis, G20 nations made available \$2 trillion in stimulus, the equivalent of 1.4% of 2008 world GDP⁵. But governments enjoyed varying degrees of success in actually moving funds out the door. Key lessons from last time:

- **Avoid regulatory bottlenecks:** Simple implementation processes work best while those that require private players to jump through excessive hoops can struggle. By end-2011, for instance, the U.S. had only disbursed 36% of its announced green stimulus, in part due to red tape.
- **Expect only so much private sector:** Private capital should be leveraged when possible, but investors will pass if they lack confidence that demand will exist for whatever new capacity they bring to the market. Fears of “pushing-on-a-string” kept many private players on the sidelines in 2009-10, despite offers of generous cost-sharing grants, tax credits or loan guarantees.
- **Move swiftly, but carefully (and manage public expectations accordingly):** Governance challenges are inevitable when shoveling tens of billions of dollars out the door. Some undeserving programs, companies or projects are bound to secure funding. Chances for waste, fraud and abuse all rise. The onus is on policy makers to ensure these are minimized but honest politicians might consider acknowledging to the public that such problems are very difficult to avoid. Examples of after-the-fact problems discovered last time governments sought to prime the pump in a massive way included:
 - **China:** In less than a month, local governments proposed an aggregate 18 trillion yuan (\$2.5 trillion in 2020 dollars) in investment initiatives, rising to 25 trillion yuan (\$3.5 trillion), according to a 2011 OECD study. This resulted in a “tsunami of credit expansion”,⁶ as China’s total debt ballooned from \$7 trillion in 2007 to \$18 trillion in 2012.
 - **The U.S.:** The Department of Energy’s loan-guarantee program attracted serious criticism after providing \$525 million to thin-film solar equipment manufacturer, Solyndra which closed its doors two years later.⁷ Republicans in Congress sought to score political

⁵ [ibid.](#)

⁶ Wong, C., ‘[The Fiscal Stimulus Programme and Public Governance Issues in China](#)’, *OECD Journal on Budgeting*, Vol. 11/3, 2011.

⁷ [Solyndra, The Big Start-Up That Couldn't](#) ([web](#) | [terminal](#)).

points by accusing the Obama administration of wasteful spending and favoritism by backing the company, even though the loan guarantee program was largely successful.

- **Australia:** Four workers participating in the country’s Home Insulation Program died, in part because of poor implementation of the scheme, according to the [royal commission into the scheme](#).

4. Power

The electricity sector has seen significant changes in the recent years, with increasing renewable power generation (utility- and small-scale), energy efficiency and new sources of demand such as electric vehicles. But, while wind and solar now account for almost a fifth of installed generation capacity worldwide, rising electricity demand in developing countries meant that power-sector emissions still rose 6% over the last seven years. With that in mind, this section outlines potential areas for green economic stimulus in the electricity sector.

4.1. Wind, solar and battery storage

PV and onshore wind today represent the cheapest sources of new-build generation for at least two-thirds of the global population, according to BNEF’s recent analysis of levelized costs of electricity (LCOE).⁸ As providers of the lowest-cost megawatt-hours of power, wind/solar have the potential to offer governments the most bang for per stimulus buck.

Renewable technologies, in particular solar, also have more job creation potential. In 2019, nearly 250,000 people in the U.S. spent at least half their time on solar-power-related work – four positions for each megawatt of installed capacity, according to the 2020 [U.S. Energy & Employment Report](#) (USEER) (Figure 4). Bioenergy is even more labor-intensive, principally due to the high number of fuel-related jobs, especially in agriculture. Like most areas of the economy, the renewables sector has seen unemployment rise since the start of the pandemic: in the U.S., over 95,000 renewables workers lost their job in March and April 2020 – a trend that has likely worsened since then.⁹

Figure 4: Workers required for each 1MW of generating capacity in the U.S.

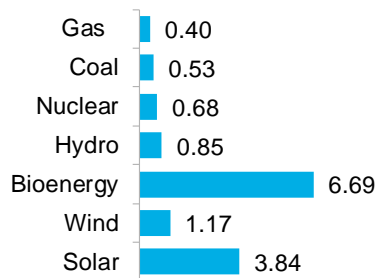
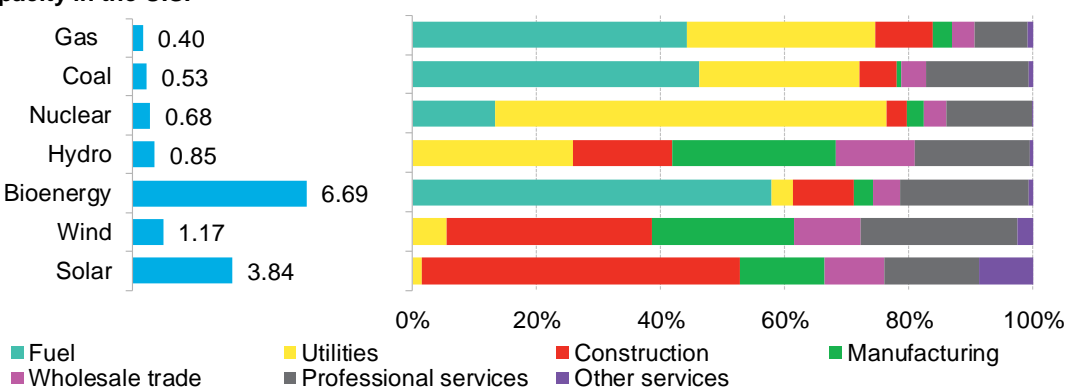


Figure 5: U.S. energy jobs, by type



Source: USEER, BloombergNEF. Note: Includes majority-time solar workers only. Fuel-related jobs were broken down based on fuel consumption by end use from the U.S. Energy Information Administration.

By comparison, fossil fuels are much less labor-intensive, with natural gas averaging 0.4 workers for each megawatt. They also have a larger share of jobs tied to a particular location due to fuel

⁸ 1H 2020 LCOE Update ([web](#) | [terminal](#)).

⁹ Data from Environmental Entrepreneurs, BW Research. Covid-19 Indicators Update: Clean Power ([web](#) | [terminal](#)).

extraction and processing (Figure 5). In contrast, nearly half of solar and wind employees work in construction, and another 18% provide 'professional services', potentially making it easier to create and fill jobs in those sectors.¹⁰

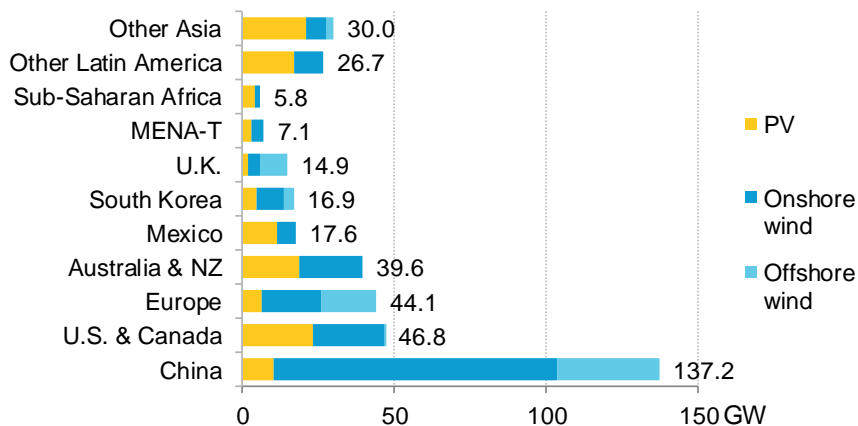
As with wind/solar, costs associated with energy storage have plummeted in recent years. As a result, in many markets, it is now competitive with many technologies that provide peaking services to the power system; but it can do so without the emissions of a gas-fired plant, and the environmental and social challenges of pumped hydro. Still, because it is still tough to undercut new-build combined-cycle gas turbines on cost grounds alone, recovery packages could include support for new battery storage projects. The battery storage sector has also seen significant growth in terms of job creation over recent years. The U.S. workforce expanded 38% between 2016 and 2019, according to the [U.S. Energy & Employment Report](#). Storage projects have the same advantage as wind and solar plants in that nearly half of the workforce is concentrated in construction.

Ideas for action

Accelerate and expand programs to spur clean power deployment

There is no shortage of planned renewables projects, with 387GW of permitted PV and wind capacity in the pipeline worldwide, based on BNEF data (Figure 6). Therefore, governments should use stimulus programs to ramp up wind and solar power uptake by using the mechanism that has proven most effective in their market.

Figure 6: Permitted PV and wind projects



Source: BloombergNEF. Note: MENA-T = Middle East, North Africa & Turkey. NZ = New Zealand.

Auctions and tenders

Over 70 countries, especially in Europe, Asia and Latin America, already have auction or tender schemes in force at national or subnational level, with 87GW of capacity due to be auctioned in future rounds.¹¹ In any case, these programs can be replicated based on other countries' models, and can be quick to set up or expand if they are already in place. These measures would also

10 The USEER report defines professional and business services as those that provide support for energy-related activity. Examples are software development and other information services, finance and insurance, real estate, scientific and technical services, management and administrative support.

11 2Q 2020 Global Clean Energy Auction Results and Calendar ([web](#) | [terminal](#))

boost revenue certainty for wind and solar projects in markets seeing signs of price cannibalization.¹²

Governments concerned about outlays could award feed-in premiums (ie, top-ups on wholesale power prices) instead of fixed tariffs. Alternatively, they could implement auction schemes to award 'subsidy-free'¹³ contracts-for-difference (CfD) under which projects compete in an auction where the agreed strike price (fixed price payment) would be below a reference price. Generally, this value is taken to be the forecast wholesale power price over the CfD lifetime but there are other ways to do this.

Tax incentives

Fiscal incentives have spurred substantial renewables build in a number of markets, with the investment and production tax credits historically particularly important for growth in the U.S.¹⁴ Such measures can be quick to introduce and can require less direct government outlay compared with other initiatives. They are not cost-free, however and can add even more direct cost if the subsidy is delivered in the form of a cash grant rather than a tax credit. This was the case under the stimulus program the U.S. implemented after the 2008-09 financial crisis and is being sought again today by clean energy advocates in Washington.

Renewables mandates

Renewables portfolio standards (RPS) require electricity suppliers to source a certain share of electricity from renewables. Strictly speaking, they are not economic stimulus measures but they have been successful in incentivizing wind and solar build in the U.S. and Australia, for example. Policy makers should ensure that the obligation is set sufficiently high to spark change but, in some markets, they may want to be sure that the program does not result in substantial increases in retail electricity bills.

Introduce incentives for renewables projects to add battery storage

Auction programs for wind and solar could include firming requirements to incentivize the addition of battery storage. These mechanisms have been relatively rare to date because they have tended to make the associated renewables project less profitable. However, in the U.S., recent PPAs for solar-plus-storage are closing in on price parity with wholesale power prices, and in India renewables-plus-storage projects have begun to threaten new-build thermal assets.¹⁵

In markets where renewable portfolio standards mandate clean energy build, the number of certificates offered per unit of generation could be upped for wind/solar projects co-located with storage systems. One example of this to date is South Korea's REC scheme, where a higher

¹² Renewables generators are increasingly reliant on revenue from the wholesale power market, as subsidies expire. However, the influx of generation with low or no marginal costs onto the wholesale market is already starting to pull down realized electricity prices for wind and solar. This may mean that renewables generators may not be able to meet their target returns. *Power Market Design: Investment Signals & Missing Money I* ([web | terminal](#)), and *II* ([web | terminal](#)).

¹³ This does not necessarily mean no financial payment from government to project for power generation (BNEF's definition of a 'subsidy'). Rather, it means that no such payment is expected – based on current forecasts of, say, the wholesale power price. Or it could mean that the government would be in a neutral net cost position, taking account of all payment in- and outflows over the renewables project lifetime.

¹⁴ Outside the stimulus process, the U.S. Treasury Department and Internal Revenue Service [announced in May 2020](#) a deadline extension for the production and investment tax credits. This would mean companies could still claim credits if they began construction on a project in 2016 or 2017 and can provide evidence of continuous work.

¹⁵ *BNEF Signposts, 2Q 2020* ([web | terminal](#)).

multiplier for storage-plus-renewables has driven build, although the especially generous bonus payments have been expensive for government.¹⁶

A 'clean peak standard' would aim to achieve the same goals and such a program is under development in Massachusetts.¹⁷ In this case, more certificates are created per unit of generation during the morning and evening peaks. Production in the middle of the day receives a lower multiplier. For solar projects to participate in the program, they typically must add or include storage.

Incentivize small-scale solar and storage

Massachusetts has also recently proposed to expand its small-scale solar incentive to require all systems over 500kW be paired with storage¹⁸ The Solar Massachusetts Renewable Target (Smart) program, which incentivizes solar projects of up to 5MW through a feed-in tariff compensation scheme, would also double in size to 3.2GW, under the emergency regulation filed on April 15. The level of interest in Smart is high, with applications by December 2019 totaling three-quarters of its initial quota.

Residential and commercial PV installations have dropped since the start of the crisis as consumers and business owners have reined in spending. BNEF's *2Q 2020 Global PV Market Outlook* ([web](#) | [terminal](#)) highlights that some sizeable residential solar markets have been affected by the economic uncertainty, including the U.S., Japan, India and Australia. Support for small-scale solar and storage would create jobs and improve resilience and energy access.

Governments have several options:

- **Financial incentives:** South Korea has doubled the subsidy for rooftop solar systems in 2020 to cover up to 80% of installation costs, making it one of the most generous support programs in the world.
- **Fiscal incentives:** Italy's latest stimulus package increases the income tax rebate for PV systems (under 20kW) from 50% of capex to 110% if installed during a 'green home renovation'.
- **Public procurement:** Policy makers can step up efforts to procure small-scale PV-and-solar systems for use on public buildings, including offices and schools.
- **Budget increases:** Switzerland has expanded the 2020 pot available for rooftop PV by 46 million Swiss francs (\$47 million).
- **Red-tape reduction:** Portugal's Ministry of the Environment has said it will fast-track 30MW of commercial-scale PV projects (220 self-consumption systems under 1MW) as Covid-19 stimulus.

Pay to expand public acceptance

Nimby-ism remains a consistent problem for renewables developers. Environmental litigation contributed to the lowest level of onshore wind build in 2019 in Germany for over a decade (Figure 7).¹⁹ Governments might consider using stimulus funds to bolster public acceptance of key projects. Some of the ideas below have been implemented by developers themselves, but this can increase project costs and could deter renewables deployment. In the case of economic stimulus, the onus should be on the government to...

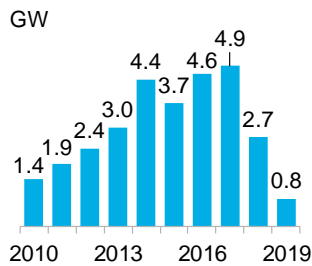
¹⁶ *Global Energy Storage Review Part 1 – Overview* ([web](#) | [terminal](#)) and *Part 2 – Case Studies* ([web](#) | [terminal](#)).

¹⁷ *Case Study: Massachusetts Pioneers Renewables Peak Pricing* ([web](#) | [terminal](#)).

¹⁸ *Massachusetts' Smart Moves Toward Solar-and-Storage* ([web](#) | [terminal](#))

¹⁹ *German Onshore Wind Is in Dire Straits* ([web](#) | [terminal](#)).

Figure 7: Germany onshore wind annual additions



Source: BloombergNEF

- Offer direct funds for community centers, playgrounds or other public facilities close to projects: Winners of South Africa’s renewables auction program have to engage with the local community around project sites and meet requirements on local ownership.
- Establish funds to compensate homeowners for any declines they see as a result of proximity to projects: in Denmark, if a house value declines due to a nearby onshore wind farm, the plant operator must award compensation to the house owner.
- Pay developers for small stakes in projects and awarding those to impacted local communities: Also in Denmark, at least a 20% share in an onshore wind project must be offered to local residents, and the community receives a direct allocation per megawatt of power generated.
- Introduce incentives to promote community ownership of renewables generation: For Ireland’s new auction scheme, each winning developer has to contribute to a community benefit fund at a rate of 2 euros per MWh per year. This should result in at least 6 million euros each year for communities living close to renewables projects. These will also have the chance to invest in projects.

Invest in worker training and re-training

Jobs related to renewable power generation tend to be concentrated in particular markets: 60% of the 11 million workers worldwide is based in China, the EU and Brazil (2018), according to IRENA data. However, governments can help to create local opportunities through direct job creation programs, especially existing schemes (to boost the timeliness factor). For example, in Pakistan, day laborers who lost their jobs due to the pandemic have become tree planters as part of the ‘10 Billion Tree Tsunami’ program. The government granted an exemption from lockdown to allow the forestry agency to restart the program and create more than 63,000 jobs.

Policy makers can also invest in worker re-training programs to help those employed in legacy segments of the energy sector transition into lower-carbon areas. Lack of experience and technical skills was the top challenge facing employers in the power sector, according to the 2020 U.S. Energy & Employment Report. What constitutes the ‘desired skills’ is changing with move away from fossils, but there are parallels: “Working as a miner involves operating and maintaining equipment and conducting repairs as needed, which is also the case for [wind] turbine technicians,” David Sale, chief executive of Goldwind Americas wrote in an emailed statement to Bloomberg in 2018.²⁰ “The transferability stems from miners’ aptitude for technical work and thinking, and their familiarity with working in line with important workplace safety measures,” he explained.

By 2050, coal will account for only 12% of power generation worldwide, according to our latest *New Energy Outlook* ([web](#) | [terminal](#)). Governments could therefore focus stimulus on ensuring a just transition for regions and sectors that will be hardest hit by the transition. To date, such efforts have often focused more on awarding financial support to displaced coal miners than on re-training but there have been exceptions. In Spain, the government signed a deal in 4Q 2018 that allowed 60% of coal miners in certain regions to take early retirement while the rest were given paid leave to train for jobs in other sectors, with priority access to positions linked to the environmental restoration of mines.²¹ In addition, the government was to award 250 million euros to restore the mining regions.

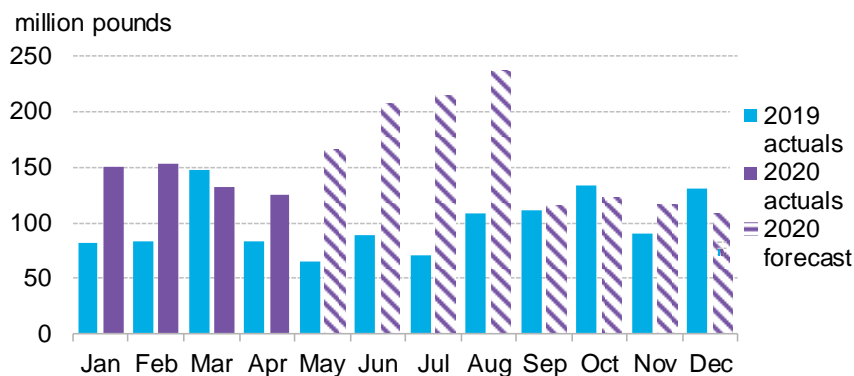
20 BloombergNEF, Sunnier Times Ahead For Coal Workers In Renewables, Tech, Powering Past Coal Alliance, December 2018.
 21 Spain Kicks Off Coal Exit ([web](#) | [terminal](#)).

Others could follow Spain’s example. The European Commission could accelerate implementation of its Just Transition Mechanism, a central component of its plan to reach climate neutrality by 2050 announced in 2019.²² One of the Mechanism’s sources of financing – the new Just Transition Fund – will help workers to find openings in, and develop skills for, the job market, and fund new economic opportunities to create jobs. To receive support from the Fund, member states need to outline just transition plans out to 2030 that are in line with reaching climate neutrality.

4.2. The grid

Covid-19 and the associate responses have provided an unexpected glimpse at the future of a high-renewables penetration electricity grid. Reduced demand is exacerbating typical spring operability issues, such as high curtailment, high voltages and low inertia. Interventions by control room operators are more frequent, and operators rely more heavily on ancillary services. National Grid ESO estimates that operating the U.K. electricity grid will cost an additional 493 million pounds (\$606 million) compared with last summer.²³ This unprecedented 150% increase is due to coronavirus-related demand reductions and will strain utilities’ balance sheets. During periods of low demand, inflexible generation such as wind and solar tend to stay online, displacing power stations that provide services to manage the reliability of the grid. National Grid incurs charges to reconfigure the resource mix.

Figure 8: National Grid ESO’s balancing service charges



Source: National Grid ESO. Note: 2020 forecast data as of May 15, 2020.

Investment in the electricity grid should help to create jobs and boost resilience: the crisis has weakened system reliability due to long repair times, a higher probability of outages and labor shortages. However, stimulus targeted at the electricity grid would not be 100% green unless the generation mix is 100% green.

Ideas for action

Accelerate development of in-progress projects

Recovery packages could include support for large-scale, state-funded projects to expand and reinforce the electricity network. This would particularly be an opportunity in more advanced developing economies wanting to improve energy access. However, to ensure stimulus has the biggest economic impact, governments should focus on projects already in the pipeline. Two countries have already announced dedicated stimulus targeted at specific in-progress projects:

22 [EU Spells Out 1 Trillion-Euro Green Deal Plan \(web | terminal\)](#)
 23 [Cost to Run U.K. Grid Skyrockets, Up 150% From Last Summer \(web | terminal\)](#).

- **China:** Ultra-high-voltage (UHV) transmission lines are prioritized under seven 'new infrastructure' sectors identified by the government as key to recovery. BNEF estimates that some \$27 billion will be invested in such grid projects in 2020. As an example, on February 28, State Grid kicked off a project to construct an UHV direct current line connecting Shaanxi and Hubei.²⁴ The 1,137km 8GW project is expected to create 40,000 jobs.
- **Malaysia:** The government has said that state-owned companies like utility Tenaga Nasional Berhad will invest up to 13 billion ringgits (\$3.1 billion) in programs like LED street lights, transmission lines and rooftop solar power projects. A further 150 million ringgits (\$2 million) was confirmed for the maintenance of electricity supply infrastructure in rural areas.

Government should ensure that while timeliness is an important prerequisite for good green stimulus, this should not be at the expense of the due diligence process. We have already seen several governments relax environmental regulations citing the impact of the pandemic.²⁵ U.S. President Donald Trump signed on June 4 an executive order calling on federal agencies to use emergency powers to "accelerate" infrastructure projects on federal lands as a response to Covid-19. As a result, large projects such as new mines, pipelines and roads would be able to bypass significant environmental-protection laws such as the National Environmental Policy Act (NEPA) and Endangered Species Act.

Boost public understanding of electricity-delivery infrastructure

Large projects to extend or reinforce the electricity network can face considerable delays due to objections from the public. For example, in the EU, 17% of large transmission-grid works categorized as 'projects of common interest'²⁶ were delayed over 2017-18 and another fifth have been rescheduled. As a result, transmission grid operators in the EU expected to spend over half of their investment out to 2030 to underground or submarine cabling due to opposition to overhead lines. The complaints have been loudest in Germany where developers have had to switch to underground cabling. Residents in Ireland and the Netherlands have also raised objections.

As part of an awareness-raising campaign, policy makers could highlight benefits to local citizens in terms of decarbonization or power prices. They might note that grid extensions can be better than costlier, more invasive alternatives. They should also directly address concerns that transmission will depress property values. They could take a page from Denmark, where, as mentioned above, wind farm developers are required to compensate homeowners directly if their property values sink. In addition, government should ensure that issues over federal/state jurisdiction should not delay projects.

5. Transport

Virtually every segment of the transport sector has been hit by the Covid-19 pandemic. Bailing out airlines, automakers and others gives governments the chance to demand these industries focus on environmental impacts. Given the sheer number of jobs at stake, it is unsurprising that the sector accounted for some 57% of stimulus announced as of June 2020. Yet only 3% of the \$613 billion that governments have put on the table is contingent on companies meeting certain green conditions. Worse still, the pandemic has prompted some countries and states to relax environmental and carbon regulations to reduce the burden on companies. Local governments in China are loosening restrictions on new vehicle license plate allocations and slowing the

²⁴ *China Targets Cleaner Sectors to Revive Post-Virus Economy* ([web](#) | [terminal](#))

²⁵ *Covid-19 Green Policy Tracker* ([web](#) | [terminal](#))

²⁶ Projects of common interest are a category of projects that the EU has identified as having significant benefits for multiple member states and contributes to the integration of the energy system.

introduction of new fuel efficiency standards. Both policies have historically been key drivers of EV sales in the country.

Ideas for action

Make it easier and cheaper for citizens to walk, bike and scoot

Preliminary data suggests that reduced road congestion due to the pandemic has helped improve air quality in certain cities. Having seen these benefits, governments could introduce incentives to promote active mobility – ie, walking, bicycles and scooters (including electric models). This would offer the additional benefit of reducing pressure on roads as commuters avoid public transport. Some countries have already announced such initiatives: France plans to spend 20 million euros (\$20 million) to promote cycling, and accelerated elements of its sustainable mobility package allowing private-sector employers to cover employees’ travel costs provided they use alternatives to a private car (eg, carpooling, e-scooters or bikes). The U.K. has brought forward 2 billion pounds (\$2.55 billion) of funding to encourage cycling and walking. It intends to build new bike lanes, widen sidewalks, and introduce vouchers and more facilities for cycle repairs. In addition, trials for rental e-scooters are to begin in the next month or so, rather than in 2021, and will determine whether such scooters used on public roads under similar rules to bicycles.

Fund a major EV charging infrastructure build-out

The world needs some 290 million charging points by 2040, to meet the growing EV fleet, according to BNEF’s *Electric Vehicle Outlook 2020* ([web](#) | [terminal](#)) (Figure 9). This amounts to \$111 billion of investment in public charging for passenger and commercial vehicles over the next 20 years.

China has already announced \$2.1 billion for EV infrastructure, or 31% above what would be required 2020-25 to accommodate EVs on the road, according to our long-term analysis of the EV market. France’s auto package released May 26 calls for accelerated deployment of EV chargers, including a higher target for 100,000 points by 2021. Moreover, the state will cover up to 75% of the costs for installing chargers. Other countries could emulate France by using local government electricity unions (known as ‘syndicats’) to help fund the large-scale roll-out of chargers. This approach has put France in fourth place in terms of public charging points, while in third place is the Netherlands where the government is partnering with private sector players to offer ‘on demand’ installations of EV chargers outside citizens’ homes.

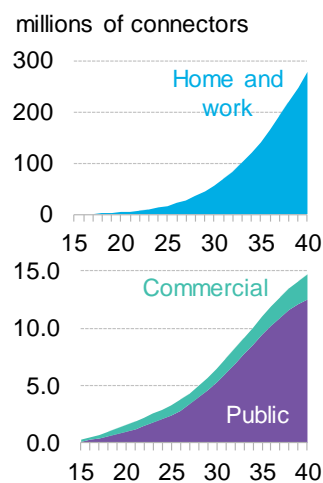
Expand purchase incentives to accelerate EV cost-competitiveness

EVs achieve price parity with internal-combustion engine vehicles by the mid-2020s in most automobile segments, according to our *Electric Vehicle Outlook 2020*, but there is significant variation between geographies. Until this tipping point is attained, policy support is still required. Principal options for fiscal stimulus include...

- **Scrappage schemes:** Paying vehicle owners to retire old cars in favor of newer, more efficient ICE vehicles or EVs, as in France and Romania.
- **Financial incentives:** Offering grants or loans to vehicle sticker prices as is undertaken in China, Germany and Japan
- **Fiscal incentives:** Promoting EV purchases through tax schemes such as the income tax credit in the U.S. or tax exemptions in Chile.

Stimulus will provide more timely support if governments can use existing or close-to-implementation programs, delivery channels and solutions. For example, France’s automotive package announced May 26 includes 13.4 billion euros (\$15 billion) of additional funding for its

Figure 9: Cumulative global installed charging infrastructure by category



Source: BloombergNEF, *Electric Vehicle Outlook 2020* ([web](#) | [terminal](#)).

purchase subsidy scheme and extra conversion bonus for its scrappage scheme. As a result, it will have the highest direct support for battery EVs in Europe and second globally. Financial incentives in general are more likely to have faster impact on consumers' pockets than fiscal policies.

Proper scrappage schemes should be designed carefully, requiring consumers to trade in diesel or gasoline vehicles for zero-emission cars. If not or if the compensation offered for swapping to an EV is insufficient, consumers may opt for cheaper but more efficient ICE vehicles, locking in those emissions for another eight years or so.

Overall, governments should ensure recovery packages that target transport are green-weighted and structured to deliver on promises. As an example, China announced on March 31 that it would extend for two years subsidies and purchase tax exemptions for 'new energy vehicles'. However, it provided further details of support on April 23: as of this year, China only plans to subsidize the first 2 million passenger and commercial EVs, and e-buses sold in the country annually; and the subsidy rates will decline each year until expiration in 2022. In addition, recent policy changes have benefited ICE vehicles: some major cities have relaxed ICE purchase restrictions and the central government has postponed the nationwide implementation of stricter emission standards to support an auto sales recovery.²⁷

Invest directly in EV and battery manufacturing capabilities

Governments wanting to future-proof their auto making industry could invest directly in new manufacturing capacity for EVs or batteries. This could take the form of state procurement programs or financial incentives such as loans or loan guarantees. France has opted for the latter in its 8-billion-euro (\$9-billion) package for the automotive industry. This includes 600 million euros (\$670 million) of public-private funding targeting equipment suppliers, alongside 200 million euros (\$220 million) and 150 million euros (\$170 million) of public money to finance production facilities and R&D, respectively. Automakers are also encouraged to procure parts from domestic suppliers. Overall, the country aims to ramp annual production of EVs to 1 million by 2025, requiring production to triple over the next two years.

More than three-quarters of lithium-ion battery cell manufacturing is in China, prompting some Western companies and governments to call for a reduction in this geographic concentration. France's plan includes 850 million euros (\$950 million) to promote domestic manufacturing of battery cells. With other EU countries poised to make similar announcements or having already unveiled similar support, the region is set to see cell-making capacity more than quadruple over the next five years.

Attach green strings to bailouts and supports for airlines and automakers

Governments could require recipients of support to fulfil certain green conditions, in order to spur decarbonization of transport, including harder-to-abate segments like aviation. For example, the French government has said that Air France-KLM must cut emissions, switch to lower-carbon fuels and may no longer operate short-haul domestic flights where rail offers the same route in 2.5 hours or less. In return, Air France-KLM will receive loans totalling 7 billion euros (\$7.8 billion).

Conditions do not need to be specifically linked to climate goals: under France's automaker package, for example, Renault must join the country's battery alliance with Germany to qualify for a 5-billion-euro (\$5.6 billion) credit line. The company had been reluctant to join due to the participation of French carmaker PSA. The consortium plans to build two cell factories of 32GWh in France and in Germany. Having Renault join the alliance will help Total-owned Saft, which

²⁷ For more detail, *China Proposes Covid-19 Auto Stimulus: Mixed Impact on EVs* ([web](#) | [terminal](#)) and *China Cuts EV Subsidies Despite April Sales Drop* ([web](#) | [terminal](#)).

heads the alliance with PSA, to build its order pipeline and cement its place as a European battery champion as it looks to challenge its Asian peers.

6. Buildings and industry

Efforts to decarbonize the buildings and industry sectors are running behind those for power and transport, at least so far. Fossil fuels are still employed in most space and water heating and are the main sources of direct emissions from buildings. Meanwhile, industrial heat typically accounts for a quarter of global final energy demand and 15% of annual global greenhouse-gas emissions. Governments hoping to achieve net-zero emissions must address these hard-to-abate sectors.

6.1. Energy efficiency

Energy-efficiency programs can spur economic activity while cutting emissions, provided they are designed to ensure safety and project delivery (Section 3). Efficiency initiatives can be rolled out relatively quickly and can create new, labor-intensive opportunities. Some 60% of expenditure on home energy-efficiency retrofits goes to labor, according to the [Sustainable Energy Authority of Ireland](#), while the construction sector accounts for some 13% of global GDP. Efficiency programs can also have social impacts if they target low-income citizens in inefficient housing and facing energy poverty. Some 30 million U.S. households spend more than 6% of their income on energy bills.²⁸ In 2018, some 7.6% of households in the EU-27 were unable to keep their homes adequately warm, based on [Eurostat data](#).

Ideas for action

Create state procurement programs to renovate public buildings

Policy makers stand to get the most bang for their stimulus bucks by focusing on the efficiency of buildings, particularly through initiatives that promote insulation installation. A first step to ensure timeliness would be to create or expand procurement programs to renovate state-owned buildings. Achieving energy-efficiency targets or standards could also be built into green conditions for support to a carbon-intensive sector or company.

EU renovation wave

The EU has made buildings and the construction sector central to its recovery package and plans to leverage the Green Deal's already-planned 'renovation wave'. The bloc will need to ramp up its renovation rate significantly to meet its goal for 0.8-2.4% of existing building stock to undergo retrofits each year. The current rate is approximately 0.4-1.2%/year. Achieving this would require 80-90 billion euros (\$89-101 billion) per year, according to the Buildings Performance Institute Europe.²⁹ For more, see: [How Green Is the EU's Trillion-Euro Recovery Plan? \(web | terminal\)](#).

Offer financial incentives to promote renovations of private buildings

Motivation for renovating privately-owned structures can be low due to long expected payback periods. To address this problem, governments can offer grants, concessional loans or guarantees to building owners. Support could also seek to align incentives between landlords, who tend to pay for capital-intensive works on a property (eg, installation of insulation or new windows), and tenants, who may benefit from subsequent utility bill reductions.

²⁸ ACEEE, [Understanding Energy Affordability](#), 2019.

²⁹ BPIE, [Covid-19 Recovery: Investment Opportunities in Deep Renovation in Europe](#), 2020.

Provide training and certification for energy efficiency workers

Achieving a major efficiency scale-up requires a large, skilled workforce. Funding for training and certification would help to ensure that the push for shovel-ready projects does not jeopardize the quality of implementation. Information campaigns targeting homeowners are also required and can be tied to financial support. Governments should establish and expand organizations to provide this information. By one estimate, no less than 26 billion euros (\$29 billion) in technical assistance is required to renovate the full EU building stock.³⁰

Insufficient availability of manufacturing capacity and of intermediaries such as architects could undermine long-term efficiency goals.³¹ The use of prefabricated building components and ‘plug-and-play’ solutions could serve to promote standardization and reduce costs. Digitalization and process optimization can also help speed project delivery. Governments can strengthen sector resilience by targeting support at start-ups and innovative companies that stand to be hurt most by the economic downturn

6.2. Heating

Stimulus focused on decarbonizing heating systems would create jobs. Some 30% of the 2.4 million energy-efficiency jobs in the U.S. are specifically in heating, ventilation and air conditioning, and renewable heating and cooling, according to the 2020 [U.S. Energy & Employment Report](#). This section outlines stimulus ideas to promote electrification and the use of district heating, as a way to decarbonize this sector.

Ideas for action*Pay households to swap oil-fired boilers for heat pumps*

As with transport, governments could introduce scrappage schemes targeted at oil-fired heating systems. In single family homes, air-source heat pumps are already cost-competitive with most oil heating systems. However, air-source heat pumps struggle to compete with gas boilers, in particular due to high upfront costs³² and retail power prices that tend to be higher than gas on a kilowatt-hour basis. Therefore, governments should think carefully about whether to include gas boilers as a suitable replacement technology, as this may reduce heat pump uptake.

Incentivize lower-temperature industries to switch to electric heating

Industries with lower-temperature heat requirements such the food, drink, and paper sectors, have the potential to adopt relatively easily electric heating systems. However, even under normal circumstances, capital-constrained producers or manufacturers often need financial support to make the transition because such systems entail high upfront costs. On the down side, industrial heating systems have long asset lives, potentially reducing the scalability of such support and reducing timeliness.

Help buildings and workforce prepare for heat pumps

Homes often need substantial renovations to become ‘heat-pump-friendly’. Governments could introduce stimulus to incentivize the installation of heat-distribution systems such as underfloor

30 BPIE, [Covid-19 Recovery: Investment Opportunities in Deep Renovation in Europe](#), 2020.

31 Ipsos and Navigant, [Comprehensive Study of building Energy Renovation Activities and the Uptake of Nearly Zero-Energy Buildings in the EU](#), report for the European Commission, 2019.

32 Current estimates of the upfront costs in Europe are 2,600-3,500 euros for a new gas boiler and 6,800-9,000 euros for an air-source heat pump. Ground-source heat pumps – ie, those that absorb thermal energy from the ground – are more expensive and more difficult to install.

heating, triple glazing for windows, additional wall and ceiling insulation. This could be part of a broader energy-efficiency package.

In addition, there is a dearth of qualified and informed heat pump vendors and installers. Not only does this prevent the market from scaling but faulty installations hurt the industry's reputation and can stunt growth, as has been seen to date in several European countries. Training and certification is therefore needed for potential vendors and installers, creating employment opportunities.

Support low-carbon district-heating projects in the pipeline

District heating is already key to several governments' strategies to decarbonize the buildings sector, provided the fuel mix is low-carbon.³³ It is particularly good for efficient energy provision, especially in areas of concentrated demand, and can reduce reliance on fossil-fuel imports. But to ensure that stimulus toward district heating is green, support measures must focus on renewables or the integration of waste heat.

On the down side, district heating networks typically take five years from planning to delivery. To ensure stimulus is spent when needed, governments could prioritize schemes that are already underway or close to implementation. Stimulus packages could therefore include government investment in planned heat networks, or could seek to ramp private-sector involvement by addressing some of the common risks. For example, governments could offer grants to mitigate high upfront costs, advisory services for heat mapping, or incentives to reduce uncertainty about whether there will be sufficient future demand for heat.

Low-carbon fuels

There are practical limits on the contributions renewable power and electrification can make toward complete decarbonization of an economy. Aviation, shipping and long-haul trucking all require energy stored in higher densities ill-suited for batteries. Others sectors, like steel and fertilizers, need high-temperature heat, chemical reactions or feedstock inputs that make molecule fuels almost indispensable. The development of decarbonized or 'green' gases like biomethane (also known as 'renewable natural gas' or RNG) and renewable hydrogen today appear crucial to achieving longer-term climate goals.

A combination of green gas and carbon capture, use and storage (CCUS) can enable today's natural gas industry to evolve and deliver low-carbon growth. These can also expand the industry's footprint by displacing coal and oil in major energy-consuming industries like transport and heavy industry, and could even bring a second life to aging or decommissioned infrastructure. Support for CCUS also has the potential to check the box on job creation; large-scale deployment of CCS in the U.K. to capture 75 million metric tons of CO₂ each year would support 226,000 direct and indirect jobs, according to one study.³⁴

Ideas for action

Invest in renewable hydrogen demonstration projects

Expanding green gas use will require substantial policy support to drive down costs and ensure that the required infrastructure gets built. In fact, some \$150 billion of subsidies are needed to 2030 for renewable hydrogen to bridge the cost gap with the cheapest fossil fuels and to play a substantial role in the energy system (for more see BNEF's *Hydrogen Economy Outlook* ([web](#) | [terminal](#))).

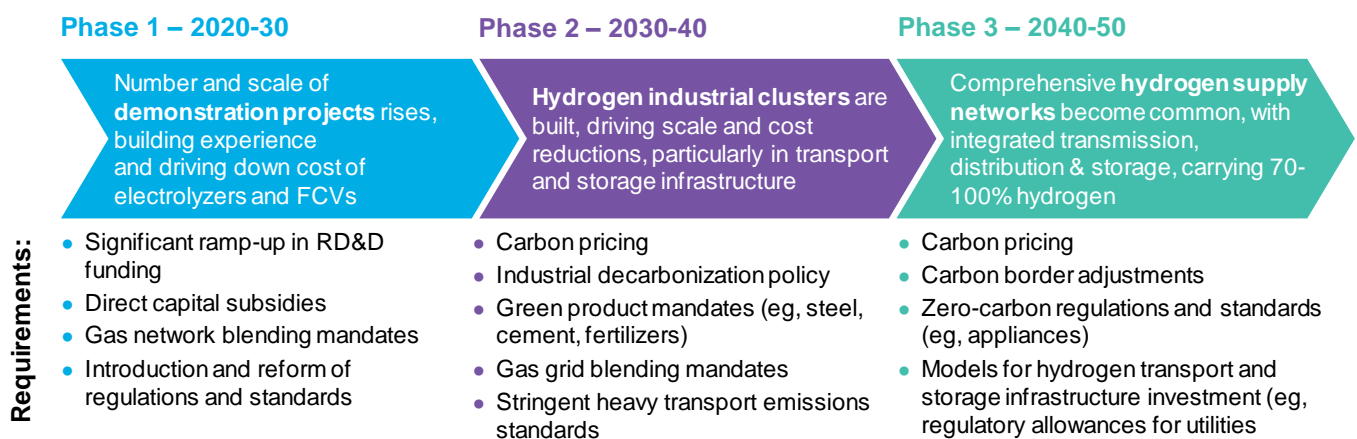
³³ *District Heating Sees Private Sector Opportunity* ([web](#) | [terminal](#)).

³⁴ Summit Power, *Clean Air, Clean Industry, Clean Growth: How Carbon Capture Will Boost the UK Economy*, 2017.

terminal)). To date, few governments have gone beyond high-level planning documents, one-off grants for R&D projects and incentives for fuel cell vehicles.

Policy makers could therefore use stimulus to spur the first phase of scale-up (Figure 10), with the main aim being to increase the number and size of demonstration projects in order to build experience and drive down electrolyzer costs. This first phase would require some \$15 billion per year of subsidies, based on BNEF analysis. Compare this with global fossil fuel consumption subsidies which have hovered around \$400 billion a year since 2010, according to [the IEA](#).

Figure 10: Three phases of scale-up required to develop hydrogen economy



Source: BloombergNEF, *Hydrogen Economy Outlook* ([web](#) | [terminal](#)).

Such a strategy would fulfil the ‘green potential’ criterion provided stimulus measures focus on renewable hydrogen or hydrogen from fossil fuels with CCS. For expediency, governments could extend existing financial incentives to support hydrogen projects or accelerate planned programs as part of their stimulus: for example, Germany’s stimulus package announced June 3 includes 9 billion euros (\$10 billion) for hydrogen, including investment grants for demonstration plants and a new pilot program based on contracts for difference. It aims to build 5GW of hydrogen-production capacity by 2030, and another 5GW by 2040.

Another example is the U.K.’s new Low Carbon Hydrogen Production Fund, which has a budget of 100 million pounds (\$122 million) and aims to deploy low-carbon hydrogen production capacity while encouraging private-sector investment. The government was [planning](#) to undertake a consultation this year and then launch the program in 2021.

Offer financial incentives for utility-scale anaerobic digesters

Biomethane generally does not require the same level of retrofitting of the gas grid as hydrogen does because it is a near-pure source of methane. Still, substantial investment in production and infrastructure will be required to scale: annual spending on biogas and biomethane rises to some \$14 billion by 2020 in the IEA’s ‘Stated Policies’ scenario.³⁵ Investment has averaged around \$4 billion a year over the last decade.

Governments could channel stimulus toward expanding production capacity through financial incentives for utility-scale digesters. Global biogas and biomethane production in 2018 was just 35 million metric tons compared to the potential 1,280 million that exists, according to the IEA. To ensure scalability, the policy should promote installation of utility-scale projects. Stimulus could include tax incentives for farmers in return for supplying the digester with organic residues and

35 IEA, [Outlook for Biogas and Biomethane](#), 2020.

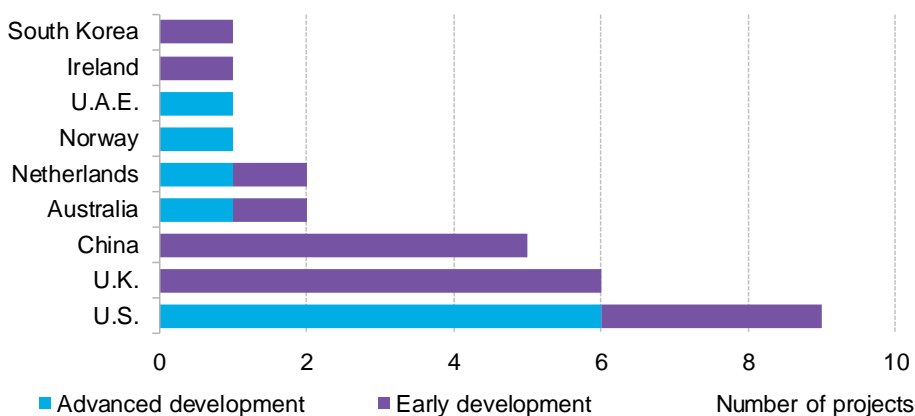
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waste. This has the potential to circumvent land-use issues associated with energy crops while generating revenue for the agricultural sector, which has been hit hard by the pandemic.

Accelerate permitting and funding for planned CCUS projects

The biggest downside facing carbon capture as a vehicle for stimulus is timeliness. Such projects take years to plan and construct. The emphasis therefore should be on projects already in the pipeline. There are 28 pre-construction, large-scale CCS facilities, of which half are located in the U.S. and the U.K. (Figure 11). The U.S. may be particularly well suited to host stimulus-backed projects thanks to the existence of the ‘45Q’ federal tax scheme, which offers credits for each ton of CO2 sequestered. The Internal Revenue Service recently issued regulations for exploiting that credit.

Figure 11: Pipeline of pre-construction large-scale CCS facilities



Source: Global CCS Institute, *Global Status of CCS 2019*, December 2019; BloombergNEF.

The U.K. government has a checkered history of CCUS support but the technology is now central to the country’s plans for decarbonization of industrial processes. Some funding has targeted hubs and clusters, adding to the growing number around the world. These can significantly lower the per-unit cost of CO2 storage through economies of scale, and potentially reduce the risk. However, the U.K. will need to ramp its existing financial commitments to meet its goal to have multiple CCS facilities operational by the mid-2020s.³⁶

One government that has already incorporated CCUS in its economic recovery package is Norway. On March 31, the country’s parliament agreed to accelerate a CCUS investment decision into the 2021 national budget. It will also initiate carbon capture studies for combustion plants in Bergen, Trondheim and Stavanger. The Ministry of Petroleum and Energy has since kicked off its assessment of the plan for the Northern Lights project, and Equinor, Shell and Total announced their intention to invest. Northern Lights is the transport and storage part of Norway’s demonstration project for full-scale CO2 capture and storage. Initial investments will amount to almost 6.9 billion kronor (\$682 million) in the first phase, and the capture component is to be Norcem’s cement plant and Fortum’s waste-incinerator plant.

6.3. Circular economy and green manufacturing

Only a third of global waste in 2016 was composted and 13.5% of it recycled, with the remainder sent to landfills or open dumps, or incinerated, according to OECD data. Increasing trade restrictions make it increasingly difficult to export waste, while there is limited land available for landfill. Even the best performing countries recycle less than three-quarters of their waste, and the

36 U.K. Energy Transition Outlook ([web](#) | [terminal](#)).

largest absolute waste producers are not the top recyclers. In addition, there is a lack of direct financial or fiscal incentives for building new recycling capacity, for example, apart from funding through extended producer responsibility (EPR) schemes, and the most common policy mechanism is targets for municipal solid waste. Government could therefore use stimulus programs to accelerate the transition from a linear to a circular economy.

Ideas for action

Incentivize new facilities for industrial composting, anaerobic digestion and recycling

Policy makers should introduce fiscal or financial incentives to encourage the building of industrial composting plants, which break down organic matter through microbial biodegradation in the presence of oxygen. Governments could also offer support facilities that undertake recycling or anaerobic digestion (AD), which treats organic matter in the absence of oxygen where waste is broken down to biogas by bacteria. Such projects can be rolled out relatively quickly, and create jobs for the construction, operation and maintenance of the facilities as well as for waste collection. Composting projects can mitigate methane emissions, and the biogas produced via AD can be used to displace carbon-intensive and potentially imported fuels or feedstock.

As part of stimulus efforts, governments could therefore procure recycling facilities directly or offer low-interest loans to private-sector players who agree to develop them. This would create jobs at the facilities themselves and downstream. For example, North Carolina has a [regional recycling infrastructure grant program](#), which awards funding to develop new facilities or upgrade existing plants to local governments or private recycling companies that partner with the local administration. This operates alongside the state's community waste reduction and recycling grant program, which provides funding to public recycling programs for projects that help communities build lasting capacity to divert materials from the waste stream and/or increase public awareness of recycling. South Korea also recently [passed a law](#) to allow the government to build, own and operate recycling plants for illegal or 'neglected waste'.

Promote bioplastics use

Given the growing problem with plastics, governments could use stimulus packages to promote the use of recycled plastics or bioplastics (ie, plastics that are biodegradable or derived from renewable biomass).³⁷ Sustainability and environmental concerns drive demand for bioplastics, which can lower dependence on oil and reduce emissions over the lifecycle of a plastic compared with petrochemical options. Policy and regulatory support for bioplastics is limited or weak, however. Stimulus packages could therefore include tax breaks for bio-content, or preferential treatment for bioplastic products in public procurement schemes. One such example is the U.S. Department of Agriculture's [BioPreferred Program](#), which mandates that all federal agencies and contractors buy bio-based products from an approved list of vendors, provided they are not excessively expensive or would hinder performance.

Pay farmers to collect feedstock for biorefineries

Incentives could be introduced to promote farmer collection of agricultural residues for use as feedstock in biorefineries. The U.S. also has its [Biomass Crop Assistance Program](#), which pays rural landowners to produce and deliver biomass feedstock to facilities for conversion to heat, power, biobased products or advanced biofuels. Policy makers would need to ensure a level playing field between bioplastics and the other options, which tend to have more political support.

37 [Bioplastics \(Part 1\): Market Overview \(web | terminal\)](#)

Increased supply would reduce manufacturers' concerns of including bioplastics in their future procurement strategies for fear of getting locked in.

Encourage remanufacturing of e-waste

Governments could seek to support the manufacturing industry by implementing stimulus measures targeting remanufacturing of electrical and electronic goods ('e-waste'), which pose a growing environmental problem as much of it ends up in landfill or incineration. The process involves dismantling a product, restoring and replacing its components, then reassembling to return it to its original performance specification. It therefore reduces greenhouse-gas emissions, material use and water consumption compared with making a new product from scratch.

Stimulus measures such as tax incentives could mitigate one of the biggest barriers for this process: ensuring that companies design products to enable remanufacturing. Government could also implement initiatives to improve communication between the design and remanufacturing product stages. As part of its circular economy action plan published in March 2020, the European Commission is planning to consider how to regulate 'planned obsolescence' and may use VAT adjustments to incentivize a remanufacturing industry.³⁸ Planned or built-in obsolescence refers to the practice of creating products with artificially short lifetimes or deliberately cutting the lifetime of existing products.

This would boost employment: reuse and remanufacturing creates 8-20 jobs per thousand metric tons of unwanted products, according to 2015 research.³⁹ This compares with 5-10 jobs for recycling and 0.1 jobs for landfill. Remanufacturing also creates twice the employment of traditional manufacturing using virgin resources. This is because remanufacturing requires that products be disassembled as well as assembled, doubling the labor needs.

7. Industrial digitalization

Digital technologies like cloud computing, blockchain or internet of things do not always reduce emissions, but there is a correlation between decarbonization and digitalization. For example, sensors and software reduce energy consumption, and artificial intelligence can help wind and solar integration. This section outlines potential areas for stimulus support relating to industrial digitalization.

Ideas for action

Invest in smart grid technologies

As in the 2008-09 financial crisis, governments could put stimulus funds into smart grid technologies, which help utilities to operate electricity systems more efficiently, reduce costs, facilitate decentralized energy systems, and build better and new services for customers. Smart grid technologies also enable utilities to respond more quickly to outages, reduce the number of affected customers and improve overall system reliability. Finally, as the last downturn demonstrated, investing in such technologies can bolster economic recovery. In response to the 2008-09 financial crisis, the U.S. put nearly \$3 billion into smart grid projects, which generated more than \$6.8 billion in total economic output and supported some 47,000 full-time-equivalent jobs, according to the [Department of Energy](#) (DOE). For every \$1 million of direct spending, GDP increased by \$2.5-2.6 million – higher than many forms of government investment – based on DOE analysis.

38 [EU's New Circular Economy Action Plan](#) ([web](#) | [terminal](#))
39 Green Alliance, [The Social Benefits of A Circular Economy](#), 2015.

Transmission system operators require in-depth knowledge of conditions on the grid. But they are often unaware of grid asset conditions such as rotting pylons and poles.⁴⁰ Stimulus programs could therefore offer funding for research and development of in-field digital technologies. These can be used to train and support workers – eg, mobile tablets, body sensors and cameras, and augmented reality (see below). The need will be even greater in the coming years, with utilities in many countries in Europe and Americas expecting a substantial share of their workforces to retire. In-field digital technologies are also being adopted by companies other than utilities.⁴¹

Table 2: Availability and adoption of in-field digital technologies

Sector	Mobile	Wearables	Digital tools	Virtual reality	Computer vision	Augmented reality
	Technology available today			Further away in the future		
Oil & gas	Adopted	Adopted	Adopted	Early adoption	Early adoption	Industry deployment
Mining & construction	Adopted	Adopted	Adopted	Adopted	Early adoption	Industry deployment
Utilities	Adopted	Pilots	Pilots	Early adoption	Early adoption	Industry deployment
Manufacturing	Adopted	Pilots	Early adoption	Early adoption	Early adoption	Industry deployment
Logistics & supply chain	Adopted	Adopted	Pilots	Pilots	Pilots	Industry deployment

Source: BloombergNEF

Industry deployment ■ Pilots ■ Early adoption ■ Adopted

Create training programs for digital technologies

As a growing number of sectors embrace digital technologies, there is a growing need for training and upskilling of workers. This is all the more important where sectors are in decline, or where a large proportion of employees are approaching retirement. Digitalization and automation are also likely to require workers to have new skills; and there is a significant shortage of qualified workers for new jobs in the energy sector, with many requiring knowledge of artificial intelligence (AI), machine learning and robotics.⁴²

Governments could use the stimulus to tackle this skills shortage. This would improve workers’ employability – a potentially important consideration for sectors such as coal, and oil & gas – and could improve job satisfaction. It should also add value to companies themselves, make them potentially more attractive to younger workers, and spur innovation. It could be achieved through financial incentives: some governments already offer grants to universities to build more AI programs. They could require that some of this financing be spent on in-company training in the new technologies. Alternatively, they could set up state-sponsored apprenticeship programs focused on digital skills.

Fund smart-city initiatives by subnational governments

Cities have been trialing smart-city technologies for years, but often lack sufficient resources to invest in large connectivity or security projects. National policy makers could use stimulus packages to help subnational governments prepare for future shocks. Indeed, smart cities are central to China’s recovery plan involving ‘new infrastructure’ and even before the pandemic, the country planned to upgrade 500 cities in the next five years.

A smart city uses information and communication technologies – eg, 5G, cybersecurity, internet-of-things platforms, micromobility platforms – to improve efficiency and quality of life. A number of governments is blending virus tracking into broader smart-city schemes, to help manage disease outbreaks and strengthen resilience. Countries are also using AI and robotics for diagnosis and

40 [Transmission Grids Go Digital with Data and Analytics \(web | terminal\)](#).

41 [Technology Radar: The In-Field Digital Services & Tools Edition \(web | terminal\)](#)

42 [Global Energy Talent Index Report 2019](#).

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treatment, to reduce the burden on healthcare workers. Wider adoption of internet-of-things applications could enable companies to operate remotely, reducing the disruption from a future pandemic or other shock. In addition, smart-city technologies can also play an important role in the transportation system by reducing congestion, increasing safety, and lowering emissions.

Investment in smart-city technologies could help to create jobs and stimulate demand: if used to manage road traffic and power grids, they could help the U.S. generate \$160 billion in benefits and savings through reduced energy consumption, traffic congestion and fuel costs, according to 2017 research by Accenture.⁴³ A \$275-billion investment in 5G infrastructure in the U.S. could create up to 3 million jobs and boost GDP by \$500 billion.

Governments could offer financing tools such as bonds (eg, general, green, energy conservation or social impact), low-interest loans or grants. They could set up procurement platforms to improve collaboration between cities and the private sector, and align priorities. The Dubai Future Accelerators, for example, were established in 2016 as 'living test beds' for public-private cooperation. Government departments such as the police or electricity and water authority publish 'challenges' that they want to be resolved, such as new smart-meter technologies for road signaling. Start-ups then bid on the challenges, and authorities provide data and expertise to which the private sector would not typically have access.

Hold cybersecurity tenders

Energy, transport, healthcare, manufacturing and other sectors increasingly rely on digital technologies to stay more connected. However, this growing reliance makes companies more vulnerable to cyberattacks, which are becoming more common, protracted and costly.⁴⁴ Covid-19 has only raised the risks; online threats in the U.K. rose by as much as six times their usual levels in April 2020, according to web security vendor [Cloudflare](#).

In the public sector, state and local authorities often lack the resources to secure adequately their digital infrastructure. Government could therefore hold tenders to award contracts to small, local companies to build and install the necessary tools. As with smart cities, stimulus packages could seek to bolster cooperation between public and private sectors.

Companies can help protect against attacks and boost resilience by complying with cybersecurity standards but there is no agreed set of rules and compliance is optional. Governments could make it a condition of stimulus support that recipients adhere to a minimum level of protection, thereby creating demand for cybersecurity services.

43 Accenture, [Smart Cities: How 5G Can Help Municipalities Become Vibrant Smart Cities](#), 2017.
44 Accenture, [The Cost of Cybercrime](#), 2019.

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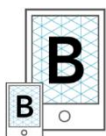
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