Technical white paper

Decrease the environmental impact of printing

HP PageWide Technology business printers

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Set a new standard in reducing environmental impact with HP—a leader in sustainability—to help drastically lower your carbon footprint. HP has a long history of developing innovative, energy-efficient products that can help customers decrease the overall carbon footprint of office printing. Groundbreaking HP PageWide Technology, featured in HP OfficeJet Pro X and HP OfficeJet Enterprise X models, is the next leap forward in energy conservation and waste reduction. These printers and multifunction devices can conserve resources and cut costs in half compared to color lasers, all while printing at revolutionary speeds.

Environmental responsibility has become an important goal—and challenge—of today’s enterprises. HP is working to help your organization improve the sustainability of office printing with revolutionary new designs that leave a smaller environmental footprint without sacrificing performance or quality.

The HP OfficeJet Pro X and HP OfficeJet Enterprise Color series boast enterprise features and print speeds previously found only on laser models, and produce brilliant prints at up to half the cost of lasers. Plus, they meet some of the most rigorous eco-labeling requirements in the world. These printers and MFPs are a great choice to help your business achieve your environmental goals—without forfeiting performance.

**Printing innovations designed with the environment in mind**

HP has long been a leader in global citizenship—it has been one of seven HP corporate objectives since 1957. Global citizenship covers governance, environment and society, and we believe that by operating profitably and responsibly, we make a positive impact on communities worldwide. For complete information on our approach to global citizenship, please download our [Living Progress Report](#).

HP printers and MFPs featuring HP PageWide Technology are the latest in a long line of innovative HP products that boast a smaller per page environmental footprint. HP launched the Design for Environment (DfE) program in 1992. DfE is an engineering perspective that seeks to optimize the environmental performance of our products, processes, and facilities. The program has three priorities:

1. **Energy efficiency**—reducing the energy needed to manufacture and use HP products
2. **Materials innovation**—decreasing the amount of materials used in HP products (which can in turn reduce greenhouse gas emissions during product transport), and using less harmful materials
3. **Design for recyclability**—designing equipment that’s easier to upgrade and/or recycle, and that has more value at end of life

Today, energy savings equal cost savings. With innovative HP PageWide Technology, your business saves with every print, using super-efficient HP OfficeJet Pro X and HP OfficeJet Enterprise X printers that use less energy than any other comparable HP ink device. You can also reduce paper waste and increase printing efficiency with features like super-fast, automatic two-sided printing, which is standard on every model.
HP PageWide Technology

HP PageWide Technology is a new printing platform that features a stationary print bar that spans the width of a page and prints entire pages in a single pass. It enables breakthrough print speeds\(^2\) and professional quality.

Environmental benefits of business printers with HP PageWide Technology

- Dramatic improvements in environmental performance for business printers (versus comparable laser models)
- The industry’s most energy-efficient business printing technology\(^4\) in its class
- Produces the smallest carbon footprint of any HP printers in their class—by a dramatic margin\(^5\)
- Can help you meet your company’s sustainability goals by lowering your carbon footprint

Enjoy the best of ink and laser

- Environmental benefits don’t come at the cost of performance—HP PageWide Technology improves printing performance across the board
- Business printers that use HP PageWide Technology are significantly faster than comparable laser printers,\(^2\) with ISO print speeds of up to 44 pages per minute (ppm, 42 ppm A4) and 70 ppm in general office mode\(^6\)
- HP’s innovative printing technologies make these printers and MFPs far cheaper to use than competitive lasers\(^3\)
- Get the same consistent, high-quality prints time after time

Read this white paper to learn more
Greater energy efficiency

Many organizations seek to reduce the energy consumption from their operations to help lower costs and achieve sustainability goals. When it comes to printing and imaging, it is during the use of the printing that most of the energy is used.

HP business printers featuring HP PageWide Technology require less energy to print a single page than any other HP printing and imaging device. These printers and MFPs use significantly less power than laser printing technology—up to 84% less—in part, because there is no fuser element to heat in order to print.

Fewer moving parts also contribute to lower energy use. The stationary printhead, with more than 40,000 nozzles, spans the width of a page, simultaneously delivering Original HP PageWide pigment onto a moving sheet of paper. Lower electricity consumption means big savings. At $.12 per kWh, printing with an HP OfficeJet Pro X printer for a year costs less than $3.70, less than 40% of the cost to power an 18W lightbulb.

Other features, like Power Handling in the HP OfficeJet Pro X series and HP Auto-On/Auto-Off technology in the HP OfficeJet Enterprise X series, offer even more energy savings. You can even set custom times for your printer to turn on and off, so it’s ready when you are. You can configure settings from the control panel, the HP Embedded Web Server or HP Web Jetadmin. The end result is that HP OfficeJet Pro X and HP OfficeJet Enterprise Color X printers and MFPs consume 50% to 84% less energy than comparable lasers in their class, so you can realize substantial savings over the life of your printer.

Independent test results: energy use

Buyers Laboratory LLC (BLI) performed independent tests comparing the energy consumption of HP OfficeJet Pro X and HP OfficeJet Enterprise Color X series printers and MFPs to leading competitive color laser printers. BLI used test methods consistent with ENERGY STAR® Typical Electricity Consumption (TEC) methodology—an Environmental Protection Agency (EPA) designed methodology to measure the energy consumption of the printers. The methodology tests devices in sleep, warm-up and ready modes and while printing, based on product default settings, to reflect a typical week’s electricity consumption.

Results: HP OfficeJet Enterprise X

BLI found the HP OfficeJet Enterprise Color X model to be among the most energy efficient among leading competitive color laser printers. Test results showed that the Konica Minolta product consumed over 108% more energy than the HP device, while the Kyocera and Lexmark products consumed nearly 49% more electricity than HP. And while the tested Ricoh used less electricity than the HP, it produced significantly more waste (see section Reduce waste and conserve resources while saving space).

Typical weekly energy consumption: HP OfficeJet Enterprise X versus leading competitive laser devices

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Average kWh per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP OfficeJet Enterprise Color X585 MFP</td>
<td>2.35</td>
</tr>
<tr>
<td>Konica Minolta bizhub C35</td>
<td>4.90</td>
</tr>
<tr>
<td>Kyocera FS-C2626 MF</td>
<td>3.50</td>
</tr>
<tr>
<td>Lexmark X746de</td>
<td>3.50</td>
</tr>
<tr>
<td>Ricoh MP C3055SPF</td>
<td>1.44</td>
</tr>
</tbody>
</table>

Read the BLI test report on HP OfficeJet Enterprise X585 MFP vs. competitive laser models.
Results: HP OfficeJet Pro X series
BLI’s tests on the HP OfficeJet Pro X551dw Printer comparing its energy consumption to leading competitive color laser printers produced similar results. BLI found the HP OfficeJet Pro X model to be more energy efficient than leading competitive color laser printers by a considerable margin. Test results (below) showed that the Lexmark product consumed over 300% more energy than the HP OfficeJet Pro X551dw, while the Ricoh consumed 407% more energy than the HP model tested.

Read the BLI test report on HP OfficeJet Pro X551dw Printer vs. competitive laser models

Typical weekly energy consumption: HP OfficeJet Pro X versus leading competitive laser devices

Lower your overall carbon footprint with HP
Carbon footprint is generally defined as the environmental impact of a particular organization, event, person or product over a given period. The primary carbon footprint of an HP printer is the sum of direct greenhouse gas emissions needed to manufacture and operate the product, as well as those needed to transport the device from the point of manufacture to sale.

The secondary footprint is the total of indirect emissions associated with the manufacture and breakdown of all associated products. For printers, this includes ink, paper, product packaging and so on. HP products can help minimize your company’s overall carbon footprint while actually improving productivity, so you can save money and expand opportunities while reducing environmental impact.

HP performs life cycle assessments (LCAs) before and after product releases to help evaluate environmental performance. HP LCAs are conducted by independent third parties to evaluate the complete environmental impact of HP products at every stage:

- Design and manufacturing
- Transportation
- Packaging
- Product use
- End of life

Business printers with HP PageWide Technology can reduce the carbon footprint of printing by up to 55%... saving the carbon equivalent of 50 gallons of gas per printer per 100,000 pages.
Through this process, HP can help reduce our customers’ environmental footprint—and our own.

LCAs conducted on HP OfficeJet Pro X and HP OfficeJet Enterprise X products with HP PageWide Technology\(^\text{15}\) found they had an overall carbon footprint up to 81% smaller than comparable ink and laser printers and MFPs.\(^\text{1}\) When replacing older, less efficient devices with fast, efficient and reliable HP OfficeJet Enterprise and HP OfficeJet Pro X series you can lower your overall carbon footprint and decrease energy costs. In fact, the HP OfficeJet Pro X models are the industry’s most energy-efficient business printers in their class.\(^\text{4}\)

These HP OfficeJet Pro X and HP OfficeJet Enterprise X printers and MFPs with HP PageWide Technology can help you take the next step toward comprehensive sustainability for your business.

### Reduce waste and conserve resources while saving space

HP PageWide Technology–based business printers have fewer moving parts to replace over their lifetime than in-class laser devices. With their unique design, these HP PageWide devices help conserve resources by using up to 94% less supplies and packaging by weight compared with lasers.\(^\text{16}\) Smaller supplies and less packaging also means you can reduce shipping and transportation costs, and your storage area will have room for more than just printing supplies.

BPI conducted independent tests to measure the supplies waste generated by HP OfficeJet Enterprise Color X series devices versus leading competitive color laser printers.\(^\text{17A}\) The HP model produced the least amount of consumables and packaging waste by weight compared to the competition.\(^\text{17B}\) In this test, weights included all user-replaceable consumable items used—toner, drums, waste container, etc.—and associated packaging.

Watch this video to see how much less waste HP PageWide Technology–based business printers produce

The total weight of all cartridges and cartridge packaging required to print 75,000 impressions was just 5.88 lbs (2.67 kg) for the HP model. Total weights of all user replaceable consumable items used (toner, drums and waste containers) and associated packaging for the competitive devices ranged from 19.53 lbs (8.86 kg) for the Kyocera product to 57.32 lbs (26.00 kg) for the Lexmark product.\(^\text{17B}\)

**BLI independent test total supplies waste results: HP OfficeJet Enterprise X**\(^\text{17B}\)

![Bar chart showing supplies waste weight (lb) for different printers](chart.png)
Changing the future of printing

MFPs and printers with innovative HP PageWide Technology can provide numerous benefits:

• Cut costs in half compared to color lasers
• Print at up to twice the speed of color lasers, with ISO print speeds of up to 44 pages per minute (ppm, 42 ppm A4) and 70 ppm in general office mode
• Best environmental credentials of any HP printing platform in their class
• Enjoy professional-quality prints that resist fading, smears and water
• Laser-like duty cycles, large-capacity paper trays and large supplies capacity
• Easy mobile printing, large color touchscreens and more outstanding features
• Meet your organization’s commitment to reduce the environmental impact of printing

See for yourself

Compare the difference between the HP OfficeJet Enterprise Color X585 MFP and comparable laser products. The following images show the amount of supplies and packaging required to print 75,000 pages. HP OfficeJet Enterprise Color X model used up to 94% less supplies and packaging than comparable lasers. The images are shown to scale, with the HP model supplies in the center.

Decrease waste with high-capacity cartridges

Get the most prints possible out of your cartridges—and decrease the amount of waste your office produces—with Original HP high-yield PageWide cartridges. Both the HP OfficeJet Pro X and HP OfficeJet Enterprise Color X series offer high-capacity ink cartridges—up to 10,000 pages per cartridge—so you can reduce your environmental impact without slowing down productivity.

Original HP high-yield PageWide cartridges provide more pages than standard cartridges, which means there are fewer spent cartridges to be disposed of over the life of the printer. In addition, HP PageWide Technology requires a lower volume of PageWide pigment to print a page compared to the volume of toner required to print a page with laser technology. The result is that HP PageWide cartridges are smaller and require less packaging, per page printed, than supplies for laser devices.
Reduce paper consumption while keeping pace with business needs

Increase your printing efficiency and reduce your carbon footprint with super-fast, two-sided duplex printing of up to 22 pages per minute in professional mode (ISO). You can reduce paper use by up to 50% by printing two pages on a single sheet. Free print management tool HP Web Jetadmin can help cut the cost of paper consumption by setting automatic two-sided printing as the default for individual devices or entire fleets (for two-sided printing capable devices).

Eco-labels and cleanroom certifications

HP OfficeJet Pro X and HP OfficeJet Enterprise Color X series devices meet some of the most rigorous eco-labeling requirements in the world. Choosing one of these MFPs or printers is the best choice to help your organization achieve its environmental goals—without sacrificing performance.

All HP OfficeJet Pro X and HP OfficeJet Enterprise Color X models are ENERGY STAR-qualified devices. ENERGY STAR is a voluntary U.S. government program managed by the Environmental Protection Agency (EPA) and recognized worldwide.

These models have also received an EPEAT Silver rating. EPEAT (Electronic Product Environmental Assessment Tool) is a procurement tool to help institutional purchasers in the public and private sectors evaluate, compare and select desktop computers, notebooks, monitors and printers based on their environmental attributes.

All of these devices are also Blue Angel-compliant. Blue Angel is a German eco-label based on criteria in product design, energy consumption, chemical emissions, noise, recyclable design and take-back programs.

The HP OfficeJet Enterprise Color X and HP OfficeJet Pro X series have been tested by UL and shown to be consistent with use in an ISO specification class 5 cleanroom, so you can feel at ease placing one right next to your desk or in other sensitive production environments where airborne particulates need to be minimized.
Focus on recycling

Recycling is a priority at HP—from the design phase through product end life.

Many Original HP cartridges have been engineered to use recycled plastic and still meet HP’s demanding standards for quality and reliability. HP OfficeJet Pro X and HP OfficeJet Enterprise X devices are made up of 4% to 6% recycled plastic.21

When it comes to cartridges, HP wants to help ensure used cartridges don’t end up in a landfill. It’s easy and free to recycle your Original HP cartridges with the HP Planet Partners program, available in more than 48 countries and territories around the world.22

Since 2000, more than 118 million pounds (53 million kilograms) of recycled plastic have been used in manufacturing new Original HP ink and LaserJet toner cartridges, keeping 2,950 tractor-trailer loads of plastic from going to landfills.23

HP recycles its cartridges using a "closed-loop" recycling process where recycled plastics from HP Planet Partners are used as raw material in new HP cartridges. No Original HP cartridges returned through HP Planet Partners are ever sent to a landfill.

For more information, visit hp.com-recycle.

History of environmental innovation

Count on a leader in environmental sustainability to help drastically lower your carbon footprint. HP has a long history of trying to do the right thing, a vision that today we call HP Living Progress. We understand that global challenges like the growing population, finite resources, economic instability and health crises present opportunities for innovative companies like HP to create a stronger, more sustainable world. By developing innovative, energy-efficient products, we can help business printing customers decrease environmental impact while expanding opportunities.

The HP OfficeJet Pro X and HP OfficeJet Enterprise X devices featuring HP PageWide Technology are some of the latest examples of our commitment to bringing the HP Living Progress vision to reality. These printers and MFPs add revolutionary advances to HP’s catalog of innovative products designed with the environment in mind.

Learn more at
hp.com/environment
hp.com/livingprogress
hp.com/go/officejetprox
hp.com/go/officejetenterprisex
hp.com/go/pagewide
1 HP OfficeJet Enterprise X series: Cost per page (CPP) claim is based on the majority of color laser MFPs $3,000 USD and color laser printers $1,200 USD as of December 2013, based on market share as reported by IDC as of Q3 2013. ISO yield is based on continuous printing in default mode. HP OfficeJet Pro X series: Cost per page (CPP) claim is based on the majority of color laser MFPs $1,000 USD and color laser printers $800 USD as of August 2013, based on market share as reported by IDC as of Q2 2013. ISO yield is based on continuous printing in default mode. For details, see hp.com/go/OfficeJet. OJ Pro ISO yield with highest-capacity cartridges based on continuous printing; see HP OfficeJet CPP based on high-capacity HP 970XL/971XL, 950XL/951XL, 940XL/935XL or standard-capacity HP 980 ink cartridges estimated street price, published yield for color prints and continuous printing in default mode; see hp.com/go/learnaboutsupplies.

2 HP OfficeJet Enterprise X series: Comparison based on manufacturers’ published specifications of fastest available color mode (as of December 2013) and includes color laser MFPs ≤$3,000 USD and color laser printers ≤$1,200 USD, based on market share as reported by IDC as of Q3 2013 and HP internal testing of printer in fastest available color mode (sample, 4-page category documents tested from ISO 24734). For more information, see hp.com/go/printerclaims. OfficeJet Pro X: Comparison based on manufacturers published specifications of fastest available color mode (as of August 2013) and includes color laser MFPs ≤$1000 USD and color laser printers ≤$800 USD available August 2013 based on market share as reported by IDC as of Q2 2013 and HP internal testing of printer in fastest available color mode (sample: 4-page category documents tested from ISO 24734). For more information, see hp.com/go/printerclaims.

3 Less energy claim based on the HP PageWide Technology array life cycle assessment (LCA) results. LCA of HP PageWide Technology array commissioned by HP and conducted by PE International as of September 2014.

4 Based on ENERGY STAR website for all color printers of print speed from 30 to 75 ipm. For more information, see https://data.energystar.gov/Active-Specifications/ENERGY-STAR-Certified-Imaging-Equipment/t2v6-g4nf.

5 Carbon dioxide equivalent (CO2e) savings of the average lifetime use of printing 100,000 pages using an HP OfficeJet Pro X576dn is up to 81% lower than the HP LaserJet Pro M570dn MFP and up to 79% lower than the HP LaserJet Enterprise M551dn Color Printer. CO2e savings of the average lifetime use of printing 100,000 pages using an HP OfficeJet 95A5dn is up to 70% lower than the HP LaserJet Pro M570dn MFP and up to 68% lower than the HP LaserJet Enterprise M551dn Color Printer. Life cycle assessments commissioned by HP and conducted by PE International in September 2014. Specific results run by HP internal LCA experts.


7 Based on internal research, the HP OfficeJet Enterprise X series, while printing, requires up to 80 watts to print. The weighted average for competing devices is 508 watts. Energy claim based on testing comparisons of major competitors in default modes by Buyers Lab Inc., March 2014. Internal testing reveals the HP OfficeJet Pro X576dn uses up to 50% less energy compared with the majority of color laser MFPs ≤$1000 USD and color laser printers ≤$800 USD as of August 2012.

8 Internal testing reveals the HP OfficeJet Pro X consumes 0.60 kWh/week of power each week. At 12 cents per kWh multiplied by 52 weeks, the annual cost rounds down to $3.70. http://energy.gov/energysaver/articles/estimating-appliance-and-home-electronic-energy-use and http://www.epa.gov/tools/faqs/faq.cfm?id=9761&3.

9 HP Auto-On/Auto-Off Technology capabilities subject to printer to printer and settings. May require a firmware upgrade.

10 HP Web Jetadmin is free and available for download at hp.com/go/webjetadmin. Universal device plug-in is offered with HP Web Jetadmin 10.3 SR4 and higher.

11 Competitive products selected based on IDC market share data for the category; March 2014: HP OfficeJet Enterprise Color X585 MFP vs. Competitive Laser/LED Models. Tests commissioned by HP and completed in February 2014 by Buyers Laboratory LLC (BLI), (201) 488-0404 or info@buyerslab.com.

12 For more information, visit energystar.gov.

13 Tests on the HP OfficeJet Pro X551dw vs. laser models Lexmark CS410dn and Ricoh SP C320DN commissioned by HP and completed in July 2014 by Buyers Laboratory, LLC (BLI), (201) 488-0404 or info@buyerslab.com.

14A Carbon dioxide equivalent (CO2e) savings of the average lifetime use of printing 100,000 pages using an HP OfficeJet Pro X576dn compared with the HP Color LaserJet Pro M476dn MFP: CO2e generated by peer-reviewed life cycle assessment (LCA) models commissioned by HP and conducted by PE International for inkjet (September 2013) and Laserjet printing (September 2013). Greenhouse gas equivalencies based on the US EPA Greenhouse Gas Equivalencies Calculator. Specific results run by HP internal LCA experts.

14B Carbon dioxide equivalent (CO2e) savings of the average lifetime use of printing 100,000 pages using an HP OfficeJet Pro X576dn compared with the HP Color LaserJet Pro M476dn MFP. The HP OfficeJet Enterprise X585dn reduces the carbon footprint of printing by 36.5% compared with the HP LaserJet Enterprise Color M551dn Color Printer the carbon equivalent is 35 gallons of gas per printer per 100,000 pages, based on CO2e savings of the average lifetime use of printing 100,000 pages. Peer-reviewed life cycle assessment (LCA) models commissioned by HP and conducted by PE international for inkjet (September 2013) and Laserjet (September 2014) printing. Greenhouse gas equivalencies based on the U.S. EPA Greenhouse Gas Equivalencies Calculator. Specific results run by HP internal LCA experts.

14C HP Color LaserJet Pro M476dn MFP. CO2e generated by peer-reviewed life cycle assessment (LCA) models commissioned by HP and conducted by PE International for inkjet (September 2013) and Laserjet printing (September 2013). Greenhouse gas equivalencies based on the US EPA Greenhouse Gas Equivalencies Calculator. Specific results run by HP internal LCA experts.

15 Life cycle assessments of HP PageWide array commissioned by HP and conducted by HP International in September 2014.

16 The HP OfficeJet Pro X576dn generates up to 94% less waste per 15,000 pages compared with major in-class competitors’ color laser MFPs ≤$1,000 USD and color laser printers ≤$800 USD as of July 2014. Tested by Buyers Lab Inc. and commissioned by HP. The HP OfficeJet Enterprise X585dn generates up to 90% less waste compared with the majority of color laser MFPs ≤$3,000 USD based on market share as reported by IDC as of Q3 2013.

17A Competitive products selected based on IDC market share data for the category; March 2014: HP OfficeJet Enterprise Color X585 MFP vs. Competitive Laser/LED Models. Tests commissioned by HP and completed in February 2014 by Buyers Laboratory LLC (BLI), (201) 488-0404 or info@buyerslab.com.

17B Weights include all user-replaceable consumable items used (toner, drums, waste container, etc.) and associated packaging. Weight for the Kyocera FS-C2626 also includes the unused waste toner tanks that are received with every Kyocera toner cartridge. The User Manual advises the user to save the waste toner tanks and only replace when the machine alerts the operator to do so.

18 Page volume based on HP 980 Black, Cyan, Magenta and Yellow ink cartridges. Average yield based on ISO/IEC 24711 or HP testing methodology and continuous printing. Actual yield varies considerably based on content of printed pages and other factors.

19 Fade resistance based on paper industry predictions for acid-free papers and Original HP; colorant stability data at room temperature based on similar systems tested per ISO 11798 and ISO 18909. Water resistance based on HP internal testing, using paper with the Color Lok® logo.

20 Based on results of third-party testing of HP OfficeJet Enterprise Color MFP X585 series with HP 980 Original ink cartridges. The device has been tested in a chamber that simulates clean room in the 4.5/5 class range.

21 Percentage figure is calculated by weight, and may vary by model and over time.

22 Program availability varies. Original HP cartridge return and recycling is currently available in more than 48 countries, territories and regions through the HP Planet Partners program. For more information, visit hp.com/recycle.

23 As of December 2012. Based on a nominal payload of 40,000 pounds (18,000 kilograms).

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