



imageWARE
Enterprise Management Console
Ecology Information Plug-in

White Paper

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Ecology Information Plug-in

The Ecology Information Plug-in (ECO Plug-in) is an optional add-in for imageWARE Enterprise Management Console. When installed, the ECO Plug-in calculates the estimated amount of CO2 emitted from Canon Multi-Function Printer or Single Function Printers. CO2 is calculated based on data collected from devices, such as job history or device status. The ECO Plug-in can take the calculated CO2 emissions and display the data in a graphical or tabular format and can generate numerous types of reports.

1. Main functions

1.1. Displaying CO2 emission

The ECO Plug-in has an analytic chart which displays calculation results of CO2 emission amounts from device usage records. The analytic chart enables users to compare output values between devices and device groups, and chart the evolution of values either by month or year. If a device map is set up by a user in iWEMC, charts can also be displayed on the registered device map.

Charts can be displayed for the following information:

- **CO2 emission**

Displays cumulative CO2 emission amount generated from Canon devices and CO2 emission calculated from the amount of printed paper per device. CO2 emission is calculated using two possible criteria: emission from paper use + emission from power consumption.

- **Page count and sheet count**

Displays the number of pages printed on devices and the number of sheets of paper output on devices. A summary of the printed pages' specifications (color/black-and-white, 1-sided/2-sided, 2 on 1, etc.) is also displayed.

- **The number of pages scanned**

Displays the total number of scanned sheets either for the fleet/month or device/month, depending on selected display.

- **Power consumption**

Displays the device power consumption calculated by the ECO Plug-in using the preset value of 'CO2 emission per 1kWh (lb/kWh)' on the "CO2 Calculation Settings" page of the Eco Plug-in and the value of device power consumption based on per time period in device status.

- **Total time of device status**

Displays the total times for each device status (processing/standby/sleep mode/power OFF).

- **Displaying Information as Lists**

Displays the CO2 emissions, page count, sheet count, and scan count as lists calculated for each month.

- **Data export into a file**

The calculation results can be exported as a file in CSV or HTML format. Users can also automatically save the calculation results for each month to a file server.

2. CO2 emission simulation

When using the optional iWEMC Accounting Management plug-in in conjunction with the ECO Plug-in users can change the print settings to paper saving settings, such as N-up (2 in 1/4 in 1) or duplex to simulate CO2 emission savings. The new simulation data is displayed along with the actual data in a graph or table.

2.1. Simulation logic when using N-up (2 in 1/4 in 1)

Using the N-up simulation users can change the graph to simulate printing 1-on 1-pages as 2-on-1 page or 4-on-1 page. The graph will then display the CO2 emission based on the selection. In this case, the ECO Plug-in simulates CO2 based on the amount of sheets and power consumption as follows:

2.1.1. Simulation by the amount of sheets of paper

N-up reduces the number of sheets users print out, resulting in a reduction of CO2 emission. For example, setting 2-up to 10 pages (10 sheets) of one-sided print makes the final output of pages five sheets of paper, rather than ten.

[The sheets of paper after N-up] × [CO2 emission per paper size]¹ × [the number of copies] = CO2 emission per paper usage

¹ Depends on the type of paper that is printed. The default plain paper carbon dioxide equivalent (CO2-e) factor used in the calculator is 1.9 kg CO2-e per kg of plain paper. Source: "Printing and Writing Papers Life Cycle Assessment Summary Report"
[http://www.afandpa.org/docs/default-source/default-document-library/life-cycle-assessment-\(lca\)-final-report.pdf](http://www.afandpa.org/docs/default-source/default-document-library/life-cycle-assessment-(lca)-final-report.pdf)

2.1.2. Simulation by power consumption

By reducing pages printed as described above, power consumption is reduced as well. This reduction in power consumption decreases CO2 emission as follows:

$$[\text{The number of pages printed after N-up}] \times [\text{Power consumption per page}]^2 \times [\text{CO2 emission per power consumption of 1kWh}]^3 \times [\text{The number of copies}] = \text{CO2 emission of power consumption}$$

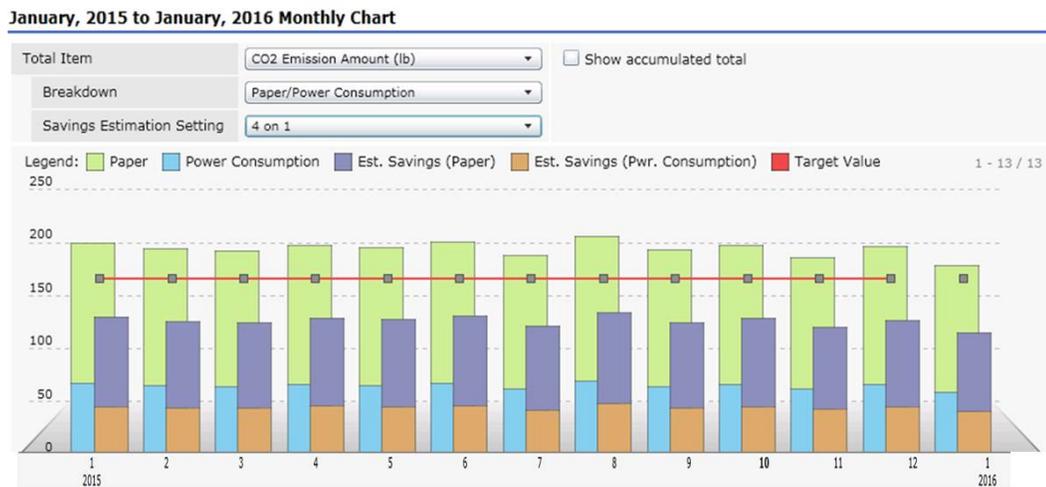


Figure 1 Est. savings based on N-up

This view of the analytic chart displays actual CO2 emission in green (Paper) and blue (Power Consumption). When the 4-up savings estimate simulation is overlaid, users can visually check against the CO2 emissions savings in purple (Est. Savings for Paper) and brown (Est. Savings in Power Consumption) to see how CO2 would be saved by using 4-up printing.

² Uses the TEC value based on the measurement conditions defined by International Energy Star Program. http://www.energystar.gov/ia/products/fap/IE_TEC_Test_Procedure.pdf

³ The default value is [1.120lb/kWh]. This value uses the CO2 emissions for generating 1kWh of electricity in 2007 from "CO2 emissions per kWh from electricity and heat generation" in the CO2 Emissions from Fuel Combustion – Highlights pg. 109, a document released by the IEA (International Energy Agency) in October 2011.

2.2. **Simulation logic when using duplex printing**

In this simulation CO2 emission is calculated when switching from single print on all pages to duplex printing. The simulation is calculated by the amount of sheets printed.

2.2.1. Simulation by the amount of sheets

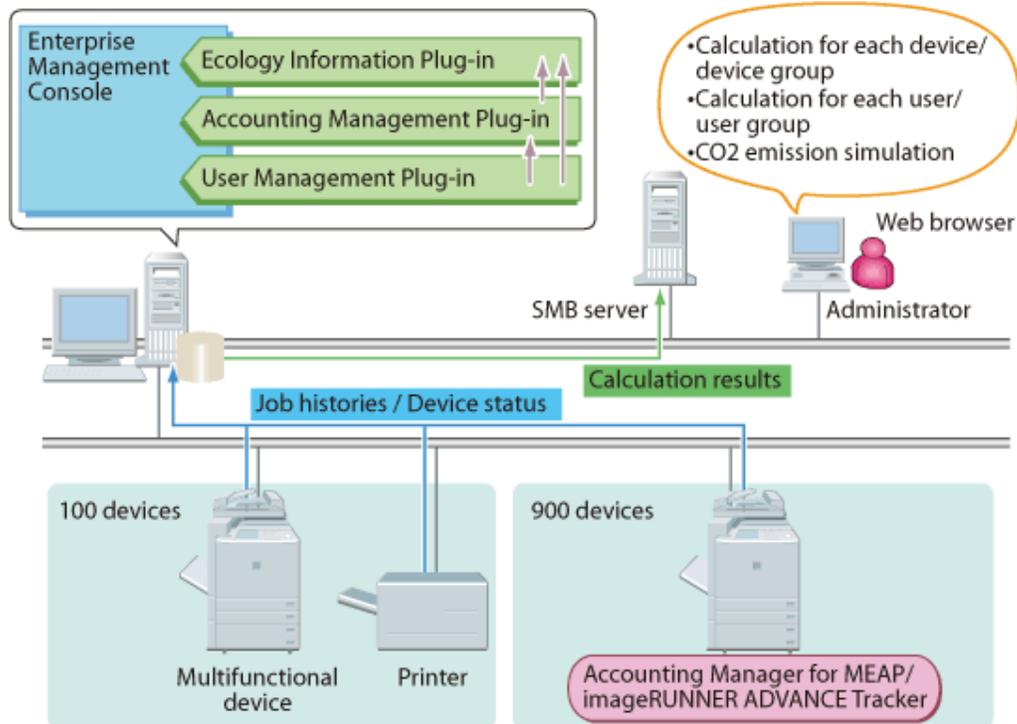
Using duplex printing reduces the sheets of paper users' print, resulting in a reduction of CO2 emission.

$[\text{Number of sheets printed after duplex}] \times [\text{CO2 emission per paper size}]^1$
 $\times [\text{The number of copies}] = \text{CO2 emission of paper usage}$

Unlike N-up, duplex printing does not decrease power consumption because the same total number of pages will still be printed per page, so the reduction in CO2 emission is insignificant.

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This is an example of the configuration when using the ECO Plug-in in conjunction with the Accounting Management Plug-in is illustrated below.



| | |
|--|--|
| Number of accounting devices: | Up to 1000. However, Accounting Manager for MEAP/imageRUNNER ADVANCE Tracker is required for the additional 900 devices. |
| Accounting devices: | Selected from the Accounting Management plug-in accounting device list (including the 100 iWEMC device list) |
| Units used for calculating device usage results: | Devices, device groups, users, user groups |
| Automatically sending calculation results to a server: | Available |
| Displaying charts for calculation results: | Available |
| CO2 emission simulation: | Available |
| Use in conjunction with Accounting Manager for MEAP/imageRUNNER ADVANCE Tracker: | Available |

4. Calculation logic for CO2 emission

This ECO Plug-in has two ways to calculate CO2 emission: CO2 emission = Emission from paper use + Emission from power consumption. The following are how they are calculated.

4.1. CO2 emission calculated from sheets of paper

CO2 emission calculations from sheets of paper are based on page size and paper type. The ECO Plug-in uses preset CO2 emission per sheet for page size and paper type that is set in the ECO Plug-in on the “CO2 Calculation Settings” page in the ECO Plug-in. These default values estimated for each paper type (used in the example below) are accordance with the values listed on "Printing and Writing Papers Life Cycle Assessment Summary Report" by the American Forest & Paper Association (www.afandpa.org)⁴. These values can be changed on the “CO2 Calculation Settings” page of the ECO Plug-in, according to the paper users use.

The equation for calculating CO2 emissions from paper is:

$$\Sigma ([\text{CO2 emission per sheet based on page size and paper type preset values}] \times [\text{The number of sheets used for each page size and paper type}]).$$

[Example]

- Print job:

The number of sheets used: 2 Letter, 4 Letter recycled paper, 3 Ledger, and 3 Ledger recycled paper.

- The number of copies: 1
- CO2 emission per sheet (default):

Letter: 0.314 lbs./sheet, Letter (recycled): 0.314 lbs./sheet, Ledger: 0.627 lbs./sheet, and Ledger (recycled): 0.627 lbs./sheet

⁴ "Printing and Writing Papers Life Cycle Assessment Summary Report"
[http://www.afandpa.org/docs/default-source/default-document-library/life-cycle-assessment-\(lca\)-final-report.pdf](http://www.afandpa.org/docs/default-source/default-document-library/life-cycle-assessment-(lca)-final-report.pdf)

[CO2 emission calculated from the sheets of paper]
= $(0.314 \text{ lbs.} \times 2 \text{ sheets}) + (0.314 \text{ lbs.} \times 4 \text{ sheets}) + (0.627 \text{ lbs.} \times 3 \text{ sheets})$
+ $(0.627 \text{ lbs.} \times 3 \text{ sheets}) = 5.646 \text{ lbs.}$

4.2. CO2 emission calculated from device power consumption

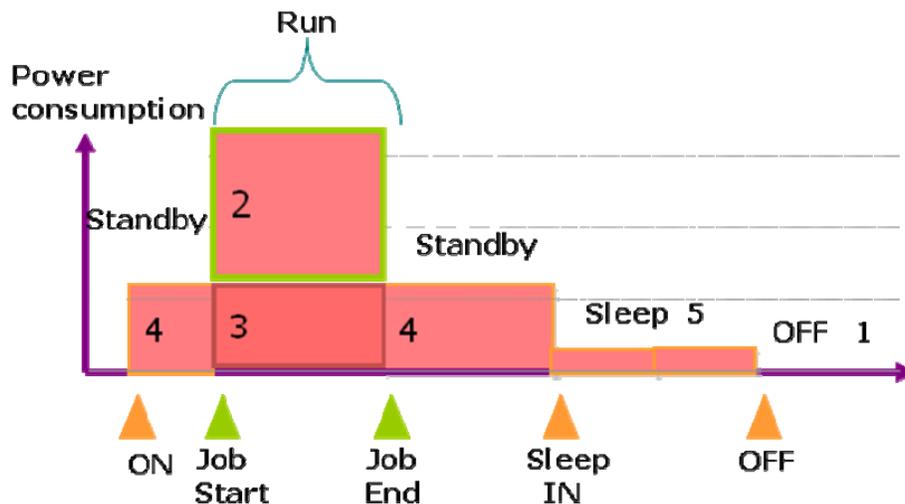
The ECO Plug-in calculates power consumption CO2 emission using the preset value of 'CO2 emission per 1kWh (lb/kWh)' on the "CO2 Calculation Settings" page and the value of device power consumption based on device status. The preset value of "CO2 emission per 1kWh (lb/kWh)" can be changed on the "CO2 Calculation Settings" page of the ECO Plug-in.

4.2.1. Specification of power consumption calculation

Power consumption is further calculated using the analysis of device status times and the use of power consumption defined for each status. Times are calculated in milliseconds.

This section explains how to calculate CO2 emission based on power consumption, using Figure 4-2. Device status types are divided in: Run (2-3), Standby (4), Sleep (5), and Power off (1).

Figure 4-2



- The SLP protocol collects job history from the devices and sends it to the ECO Plug-in. The job history includes device power status information and number of pages printed. Every device has its own preset values of power consumption per device status.⁵
- The SLP protocol can notify the ECO Plug-in of five different device status modes: Power on, Power off, Sleep in, Sleep out, and Run. A device goes 'standby' after receiving a Power on, Sleep out, or Run notification. The device goes Power off after receiving the Power off signal, and goes to Sleep status after receiving the Sleep in notification.

Table 4.2

| Status notification | Device status after receiving the notification |
|---------------------|--|
| Power on | Standby |
| Power off | Power off |
| Sleep in | Sleep |
| Sleep out | Standby |
| Run | Standby |

- The "Run" mode includes print functions such as print, copy, receiving, and box (mailbox or Advance box) print. Fax sending, send, and scanning functions are not included in Run mode. The Run mode is the time from start to end of the chosen print, copy, receiving, or box print command.
- Power consumption during the Run mode is the sum of power consumption based on the number of pages processed (2) and preset power consumption value during Run mode (3).
- The total power consumption of each device is the sum of the power consumption of Standby (4), Sleep (5), Power off (1), and power

⁵ Canon uses the Energy Star TEC value to assign a preset power consumption value per device status for Canon devices where the values are known. For other Canon devices where the value is not known Canon uses the TEC value to calculate power consumption as the ECO Plug-in collects data.

consumption calculated as above during Run mode (3).

Notes on power consumption during Run status (3)

- If two jobs overlap, the overlapped time between the jobs is only calculated once. For example, if one job runs 10:00 to 10:10 and another 10:05 to 10:15, this is a job of 15 minutes, 10:00 to 10:15. This is for the purpose of device power consumption. Power consumption per sheet is separately calculated.
- The "Analysis graph" of CO2 emission created by the ECO Plug-in shows emission in time ranges. If a job overlaps a time range, it is split between the time ranges and added as if it occurred in the time range in which the job was executed.
For example, in a job executed 10:50 to 11:05, add 10:50 to 11:00 into the time range of 10:00 to 11:00, and add 11:00 to 11:05 into the time range of 11:00 to 12:00.
- Regarding the values of Power off (1), power consumption during Run (3), Standby (4), and Sleep (5), the preset values are measured according to the condition described in the International Energy Star Program. For 3 and 4, use the value of Stand By power consumption. Calculated values are measured as watts (w) x hours (h).
- For the number of pages processed (2), the Typical Electricity Consumption (TEC)⁶ value based on the measurement conditions defined by International Energy Star Program are used. After the calculation of power consumption (wh) per sheet, multiply it by the number of sheets printed.

The equation for calculating CO2 emission based on power consumption is:

$$\{\sum ([\text{Total time of each status (h)}] \times [\text{Power consumption of each status (W)}])\} \times [\text{CO2 emission per 1kWh (lb/kWh)}]$$

⁶ Energy Star TEC Test Procedure
http://www.energystar.gov/ia/products/fap/IE_TEC_Test_Procedure.pdf

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[Example] using preset values for iR-ADV C7065 in one 24 hour period:

- CO2 emission per 1kWh: (1.120 lb./kWh)
 - Consumption of iR-ADV C7065:
Run: 100 W, Standby: 100 W, Sleep: 1 W, Off: 0.05 W
 - Status total time
Run: 1 hour, Standby: 3 hours, Sleep: 9 hours, and Off: 11 hours
-

[CO2 emission calculated from device power consumption]

$$\begin{aligned} &= \{ (1 \text{ hour} \times 100 \text{ W}) + (3 \text{ hours} \times 100 \text{ W}) + (9 \text{ hours} \times 1 \text{ W}) + (11 \text{ hours} \times \\ &0.05 \text{ W}) \} \times 1.120 \text{ lb/kWh} \\ &= \underline{458.70 \text{ lbs.}} \end{aligned}$$

5. Requirements

5.1. imageWARE Enterprise Management Console Server

The following hardware and software are required for the server computer in which the ECO Plug-in will operate.

5.1.1. Hardware

Hard Disk

Space required to operate the iWEMC database server:

- When using the ECO Plug-in by itself:
 - 500 MB to manage 100 devices for a period of 3 years
- When used in conjunction with the Accounting Management Plug-in the additional disk space required is estimated as follows:
 - 1.5 GB to manage 1000 devices for a period of 3 years
 - 150 MB to manage 100 devices for a period of 3 years

5.1.2. Software

- Enterprise Management Console: V3.1 or later.

The following optional plug-ins are required to use all the functions of the ECO Plug-in. For information on supported versions, see the Readme file of the ECO Plug-in.

- Accounting Management Plug-in
- User Management Plug-in

5.2. Client Computer

The following hardware and software are required for the computer used to operate the ECO Plug-in.

5.2.1. Hardware

Display

- XGA 1024 x 768 or higher resolution, high color 65536 colors or higher (Recommended: SXGA 1280 x 1024 or higher resolution, full color 16777216 colors or higher)

5.2.2. Software

The following software is required to use the chart display function of the ECO Plug-in:

- Microsoft Silverlight 5

5.2.3. Web Browser

- Web browser that supports Enterprise Management Console

5.3. Destination SMB Server for Sending Calculation Results

The destination SMB server that the ECO Plug-in sends calculation results to must have one of the following environments:

- Microsoft Windows Server 2008
Microsoft Windows Server 2008 Service Pack 2
 - Edition: Enterprise/Standard
 - Platform: 32 bit/64 bit
 - Protocol: IPv4/IPv6
- Microsoft Windows Server 2008 R2
 - Edition: Enterprise/Standard
 - Platform: 64 bit
 - Protocol: IPv4/IPv6
- Microsoft Windows Server 2012
Microsoft Windows Server 2012 R2
 - Edition: Standard
 - Platform: 64 bit
 - Protocol: IPv4/IPv6