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As of December 31, 2015, we were obligated to guarantee the payment obligation of our subsidiary LG Display Yantai Co. Ltd. in the amount of US\$135 million (₩158 billion) under a credit facility that LG Display Yantai Co., Ltd. entered into with Shinhan Bank. Other than the foregoing, we have not entered into any other financial guarantees or similar commitments to guarantee the payment obligations of our subsidiaries or other third parties as of December 31, 2015.

Set forth below are the aggregate amounts, as of December 31, 2015, of our future contractual financing and licensing obligations under our existing debt and other contractual arrangements:

Contractual Obligations	Payments Due by Period				
	Total	Less than 1 year	1-3 years	3-5 years	More than 5 years
	(in millions of Won)				
Long-Term Debt, including current portion	₩4,228,105	₩1,416,660	₩2,253,263	₩478,122	₩80,060
Fixed License Payment	25,901	25,901	—	—	—
Long-Term Other Payables	9,327	—	9,327	—	—
Total	<u>₩4,263,333</u>	<u>₩1,442,561</u>	<u>₩2,265,590</u>	<u>₩478,122</u>	<u>₩80,060</u>
Estimates of interest payment based on contractual interest rates effective as of December 31, 2015	₩ 245,765	₩ 108,665	₩ 118,460	₩ 15,354	₩ 3,286

In addition to fixed license payments listed above that we are obligated to make under certain technology license agreements, we also have continuing obligations to make cash royalty payments under our technology license agreements, the amount of which are generally determined based on a percentage of sales of our display products.

Expenses relating to our license fees and royalty payments under existing license agreements were ₩63 billion in 2013, ₩69 billion in 2014 and ₩88 billion (US\$75 million) in 2015, representing 3.8% of our research and development related expenditures in 2013, 4.0% in 2014 and 5.7% in 2015. We expect to make additional license fee payments as we enter into new technology license agreements from time to time with third parties.

Taxation

In 2015, the statutory corporate income tax rate applicable to us was 11.0% (including local income surtax) for the first ₩200 million of our taxable income, 22.0% (including local income surtax) for our taxable income between ₩200 million and ₩20 billion and 24.2% (including local income surtax) for our taxable income in excess of ₩20 billion.

Tax Credits

We are entitled to a number of tax credits relating to certain investments in technology and human resources development. For example, under the Special Tax Treatment Control Law, we are entitled to a tax credit of up to 4% for our capital investments made outside certain areas of Seoul on or before December 31, 2017 provided that there isn't a decrease in the number of our employees compared to the previous year.

Tax credits not utilized in the fiscal year during which the relevant investment was made may be carried forward over the next five years in the case of capital investments and five years in the case of investments relating to technology and human resources development. As of December 31, 2015, we had available deferred tax assets related to these credits of ₩385 billion (US\$329 million), which may be utilized against future income tax liabilities through 2020. In addition, we also had unused tax credit carryforwards of ₩79 billion (US\$67 million) as of December 31, 2015 for which no deferred tax asset was recognized.

Item 5.C. Research and Development, Patents and Licenses, etc.

Research and Development

The display panel industry is subject to rapid technological changes. We believe that effective research and development is essential to maintaining our position as one of the industry's leading technology innovators. Our research and development related expenditures amounted to ₩1,675 billion in 2013, ₩1,788 billion in 2014 and ₩1,547 billion (US\$1,323 million) in 2015, representing 6.2% of our revenue in 2013, 6.8% in 2014 and 5.4% in 2015.

To meet the demands of the future trends, we have formulated a long-term research and development strategy aimed at enhancing the process, device and design aspects of the existing products and diversifying the use of display panels as new opportunities arise with the development of communication systems and information technology. The following are examples of products and technologies that have been developed through our research and development activities in recent years:

- In 2013, we developed the world's first 55-inch curved 3D Full HD OLED television panel and a 77-inch curved Ultra HD OLED television panel. In addition, we developed a 105-inch Ultra HD curved TFT-LCD television panel with a 21:9 screen aspect ratio, which allows for an unprecedented level of viewer immersion. We also collaborated with Intel Corporation, or Intel, and was the first in the world to incorporate Intel's Wireless Display, or WiDi, technology in a display panel with the development of our 23.8-inch TFT-LCD monitor panel. WiDi technology allows viewers to seamlessly stream content from one display device, such as a notebook computer or smartphone, wirelessly to a display device with WiDi technology without the need for any intermediary device. With respect to smartphones, we developed the world's first 5.5-inch Quad HD panel, which was also significantly brighter and thinner (only 1.22 mm) compared to conventional panels. Furthermore, we developed and commenced mass production of a flexible OLED panel for smartphones. The plastic substrates allow the panel to be bendable and virtually shatterproof while being much lighter and thinner compared to panels with conventional glass substrates.
- In 2014, we unveiled a 98-inch Quad Ultra HD television panel, which has four times the resolution (7,680 x 4,320 pixels) of a conventional Ultra HD panel. We also developed an 18-inch transparent OLED panel (transparency level of 30%) and an 18-inch flexible OLED panel with a radius of curvature of 30 mm. We successfully commercialized a 1.3-inch circular plastic OLED smartwatch panel for LG Electronics' G Watch R smartwatch and a 5.5-inch Full HD plastic OLED smartphone panel for LG Electronics' G Flex 2 smartphone. In addition, we successfully commenced mass production of display panels incorporating three state-of-the-art technologies: M+ pixel structure, Ultraviolet Alignment and Advanced In-cell Touch, or in-TOUCH, technologies. M+ pixel structure technology improves transmittance and reduces power consumption. Ultraviolet Alignment technology utilizes ultraviolet light to more effectively align liquid crystals and improves contrast ratio and reproduction. In-TOUCH technology reduces the thickness of a touch panel as touch technology is built into the panel cell as opposed to the existing on-cell method, whereby a touch film is added on top of the panel.
- In 2015, we developed the world's first Ultra HD OLED television panels, including 65-inch and 77-inch panels that feature High Dynamic Range functionality with perfect black and improved luminance. In addition, we unveiled a 55-inch "wallpaper" OLED television panel which was slim and light enough to attach to the wall simply by using magnets or wires. We were able to achieve this width using an innovative production method whereby the electric circuits are installed in a separate process. In the commercial space, we developed the world's first 55-inch double-sided OLED panel for commercial use, which shows different images on each side while achieving a width of only 5.3 mm, as well as a 139-inch Vertical Tiling OLED display that is made of eight 65-inch OLED panels connected together in a double-sided S-curved pattern. We also successfully commenced mass production of in-TOUCH panels for notebook computers. With respect to smartphones, we developed the world's first 5.5-inch Quad HD in-TOUCH panel and the world's first 5.7-inch free-form Quad HD panel.

As the product life cycle of display panels using certain of the existing TFT-LCD technology is approaching maturity, we plan to further focus on OLED and other newer display technologies, while also exploring new growth opportunities in the application of display panels, such as in tablet computers, smartphones, smartwatches, public displays and automotive displays.

In order to maintain our position as one of the industry's technology leaders, we believe it is important not only to increase direct spending on research and development, but also to manage our research and development capability effectively in order to successfully implement our long-term strategy. In connection with our efforts to consolidate our research and development efforts for next-generation display technologies, we opened the R&D Center in Paju, Korea in April 2012.

We complement our in-house research and development capability with collaborations with universities and other third parties. For example, we provide project-based funding to both domestic and overseas universities as a means to recruit promising engineering students and to research and develop new technologies. In July 2012, we entered into an agreement with Seoul National University to establish the LGD-SNU Cooperation Center within the university's Research Institute of Advanced Materials to conduct research into display panel technologies, including OLED technology. We also enter into joint research and development agreements from time to time with third parties for the development of technologies in specific fields. In addition, we belong to several display industry consortia, and we receive annual government funding to support our research and development efforts. As of December 31, 2015, we employed 4,632 engineers, researchers, designers, technicians and support personnel in connection with our research and development activities.

While we primarily rely on our own capacity for the development of new technologies in the display panel design and manufacturing process, we rely on third parties for certain key technologies to enhance our technology leadership, as further described in "Intellectual Property" below.

Intellectual Property

Overview

Our business has benefited from our patent portfolio, which includes patents for display technologies, manufacturing processes, products and applications related to the production of TFT-LCD and OLED panels. We hold a large number of patents in Korea and in other countries, including in the United States, China, Japan, Germany, France, Great Britain and Taiwan. These patents will expire at various dates upon the expiration of their respective terms ranging from 2016 to 2035. In March 2014, we formed Unified Innovative Technology, LLC in the United States, a limited liability company solely owned by us for the purpose of patent portfolio management.

As part of our ongoing efforts to prevent infringements on our intellectual property rights and to keep abreast of critical technology developments by our competitors, we closely monitor patent applications in Korea, Japan and the United States. We also plan to initiate monitoring activities in China. We intend to continue to file patent applications, where appropriate, to protect our proprietary technologies. We also enter into confidentiality agreements with each of our employees and consultants upon the commencement of an employment or consulting relationship. These agreements generally provide that all inventions, ideas, discoveries, improvements and copyrightable material made or conceived by the individual arising out of the employment or consulting relationship and all confidential information developed or made known to the individual during the term of the relationship are our exclusive property. In addition, we have increased our efforts to safeguard our propriety information by engaging in in-house information protection awareness activities with our employees.

License Agreements

We enter into license or cross-license agreements from time to time with third parties with respect to various device and process technologies to complement our in-house research and development. We engage in regular discussions with third parties to identify potential areas for additional licensing of key technologies.

Expenses relating to our license fees and royalty payments under existing license agreements were ₩63 billion in 2013, ₩69 billion in 2014 and ₩88 billion (US\$75 million) in 2015, representing 3.8%, 4.0% and 5.7% of our research and development related expenditures in 2013, 2014 and 2015, respectively. We recognized royalty income in the amount of ₩23 billion in 2013, ₩17 billion in 2014 and ₩19 billion (US\$16 million) in 2015. The following are examples of license agreements we have entered into:

- We have a license agreement with each of Lemelson Foundation, Columbia University, Penn State University, Honeywell International, Honeywell Intellectual Properties, Plasma Physics Corporation and Fergason Patent Properties. Each license agreement provides for a non-exclusive license under certain patents relating to TFT-LCD technologies.
- We entered into a license agreement with Semiconductor Energy Laboratory which provides for a non-exclusive license under certain patents relating to TFT-LCD and AMOLED technologies. For IPS technologies, we have a non-exclusive license with Merck & Co.
- We entered into a cross-license agreement with each of Hitachi, HannStar and Hydis for a non-exclusive license under certain patents relating to display technologies.
- We entered into separate cross-license agreements with each of NEC and AU Optronics in connection with the settlement of certain patent infringement lawsuits. Under the agreements, each party grants the other party a license under certain patents relating to TFT-LCD technologies.