Abstract—The emergent markets in Brazil, Russia, India and China, popularly referred to by the acronym BRIC, now are responsible for a growing portion of profits for global companies. Working against this prize is a formidable maze of culture, laws, and overlapping regulations, causing confusion surrounding the regulatory requirements. For those entering the BRIC marketplace with electrical and electronic products, knowledge of how to obtain the necessary approvals is needed. Preparation is paramount to face the distinct and unique obstacles that will be encountered. Distance, language, unfamiliar local business norms, and unsophisticated commercial market conditions can sometime make this a difficult and expensive procedure for the uninformed. In Part 2 of this paper, covering India and China, we will reveal the major regulatory compliance components in the mix for these two countries: the government agencies, the standards, the confounding bureaucracies, and some of the key unwritten rules in these emerging markets, and help product developers and manufacturers to access this massive group of desirable customers, navigating clear pathways to marketing and selling their electronic products.

Keywords – BRIC, Brazil, Russia, India, China, Emerging Markets, Compliance, Certification

I. INTRODUCTION

With almost 3 billion residents, almost 40% of the world’s population, BRIC countries are a key target for companies keen to enter these high-growth markets. With inhabitants eager to have the same electronic gadgets as their US and European neighbors, these nations have demonstrated healthy economic growth rates, even in the face of the current global recession. Gaining access to these customers with rising wages and expanding middle classes has become a priority for increasing global market share [1].

Currently these “Big Four” countries are ranked in the top seven of the global economies, based on Gross Domestic Product at Purchasing Power Parity per capita (GDP PPP), and it is estimated that by 2027 the BRIC economies will overtake the G7 economies. China and India are the big kids on the block in terms of sheer numbers, being the first and second most populous countries in the world. China is the economic leader of the BRICs, having started their robust GDP growth curve around 1990, while the other three countries began their sustained growth trends at the beginning of the millennium. For comparison, the US is the leading importer and second biggest exporter in the world, while China is the world’s leading exporter, and the second largest importer, but both are approaching parity in terms of combined import and export monetary values [2].

II. INDIA COMPLIANCE & CERTIFICATION

India has made great strides in aligning their compliance standards and processes with those of more established markets. Their regulatory organizations are government departments, seeking to coordinate their activities as they modernize and help promote the development of industry in India. One key highlight is the wealth of information freely available online at these agencies, translated in English.

A. India Legislation

India has a parliamentary form of government, based on the British system [2]. Two ministries, authorized by Parliament, oversee the three groups responsible for the generation of rules and requirements covering electronic
products manufactured and sold in India. The first is the Ministry of Consumer Affairs, Food, and Public Distribution (MCAFPD) [3], which oversees the Bureau of Indian Affairs (BIS) [4]. The second is the Ministry of Communications and Information Technology (MCIT), with authority over the Department of Electronics and Information Technology (DEIT) [5], which oversees the Department of Telecommunications (DOT) [6], which in turn has directs both the Telecom Engineering Centre (TEC) [7] and the Wireless Planning and Coordination (WPC) wing [8].

The Bureau of Indian Standards Act of 1986 gave BIS statutory authority in creating national standards. Given the mandate to develop standards, regulatory markings, and certification programs, this agency seeks to create a culture of quality, and encourage consumer participation in creating and implementing these product requirements. In addition, they are also tasked with establishing a national strategy of integrating and promoting these standards to promote the growth and development of production and exports [9].

The DOT is the telecommunications authority in India, given enforcement authority for any laws covered by three legislated acts, the Indian Telegraph Act of 1885, the Indian Wireless Telegraphy Act of 1933, and the Telecom Regulatory Authority of India Act of 1997 [10]. In addition, the DOT is also tasked with creating and implementing policy, licensing, and coordination for all matters relating to both wired and wireless forms of communication [11].

The WPC unit under DOT is the national radio regulatory authority for frequency spectrum management, licensing, and regulation. WPC regulates devices operating from 30 kHz to 3000 GHz. For ITE equipment, the Equipment Type Approval (ETA) is the most common program. India utilizes either FCC grants and reports, or CE DoC and reports [16].

C. India Certification

There are five types of certification, one for each of the five categories of product safety, telecom system equipment, EMC, SAR, and wireless devices. Insuring all of the proper certifications are received is critical in gaining entry into the India marketplace.

1) Product Safety Certification: BIS has updated their program for product safety certification of electronics equipment, becoming effective on January 3, 2014. For new submittals, the following items are required [12]:

- Test report from a BIS-approved test lab in India
- BIS registration forms
- BIS registration number for shipments, valid for 2 years
- Test samples provided according to DEIT guidelines
- User manual, technical descriptions, and block diagrams
- Notarized attestation of an office in India, or a notarized in-country representative authorization
- Factory approval documentation for registration, with a BIS safety report for each factory

2) Wired Telecom Certifications: The TEC branch under MCIT is the authorized agency for issuing certifications for wired telecom equipment. The IR certification is the most common for wired telecom ITE equipment [17].

The submittal package for IR certification should contain the following [17]:

- TEC Form A application sheet
- EMC report per TEC/EMI/TEL-001/01/FEB-09
III. CHINA COMPLIANCE & CERTIFICATION

China has a culture and a market shrouded in mystery and intrigue for many western firms. If you want approvals for electrical or electronic products, then you will face some distinctly Chinese obstacles. There are several barriers to imported products, including distance, language, unfamiliar culture and unsophisticated commercial market conditions. A formidable maze of culture, laws and regulations confronts any company embarking on this venture [19].

A. China Legislation

The authority of all laws in China lies with the central ruling body, responsible for establishing the authorized government agencies who make and enforce electronic product regulations. After entry to the World Trade Organization (WTO), the Chinese government has undertaken a massive effort to revise its laws and regulations in accordance with WTO rules [2]. Three major government agencies exist under two different government administrative bureaus for electronic products exporting into China.

1) China National Administration of Certification and Accreditation: On May 1, 2002, the China Certification and Accreditation Administration (CNCA) was established with the responsibility for developing the legal requirements for EMC and product safety criteria for electronic products in China. The CNCA was given the authority to govern all aspects of the China Compulsory Certification (CCC) program, the certification program for EMC and product safety for these regulated devices [19], [20].

2) Ministry of Information Industry: The Ministry of Information Industry (MII) has authority for both telecommunication and radio-communication equipment. Two departments under MII are tasked with developing the legislative requirements for these two aspects; the Telecom Administration Bureau (TAB) Certification Center, and the State Radio Regulation Committee (SRRC) [19], [21].

B. China Regulation

China has two regulation-making bodies that are responsible for electronic products, CNCA and MII. The CNCA is responsible for EMC and product safety regulations, while the MII regulates both telecommunications and radio-communications equipment [19].

1) CNCA Regulations: The authority governing the CCC certification programs is called the CNCA, which publishes a catalog for 22 types of products, covering a total of 159 categories. All products in the CCC product catalog, whether manufactured by a foreign or a Chinese company, must comply with the same CNCA regulations for the specific CCC product program to enter the Chinese market.

Standards are published in Mandarin Chinese language, and official English translations are not always available. In addition, changes are frequent as technology changes and China attempts to align more with WTO standards. The standards are referred to as “Harmonized Standards”, but it should be noted that there are some major differences from

- Safety report
- Schematics, bill of materials, and user manual
- Local representative authorization letter
- Technical specification/datasheet
- TEC form B with two samples
- Certified equipment must be labeled per TEC

3) SAR Certifications: The TEC branch under MCIT is the authorized agency for issuing SAR certifications. For SAR certification, a FCC grant and report showing compliance with the most stringent criteria of the FCC standards is the most common method, although other international standards demonstrating compliance with the adopted FCC levels may be used. In addition, a user guide with the required SAR safety statements should be provided with the application [15].

4) Wireless Certifications: The WPC is the authority for wireless licensing. For ITE equipment, ETA certification is most often sought. The submittal package for WPC ETA certification should include the product’s technical specifications, FCC grant and report or CE DoC and report, and a local representative authorization letter [16].

The WPC has no labeling requirement, and their ETA certificate has no expiration date. Local companies are the certificate holders and applicants for the WPC approvals.

D. India Enforcement

India performs market surveillance to insure products are certified and manufactured as approved. Penalties for non-compliance can range from fines to civil and criminal penalties. Non-approved and non-compliant imported products are frequently seized by customs agents, who are diligent in their review of product documentation and labeling.

1) Product Safety Enforcement: BIS required labeling must be on imported products. For BIS certified products, auditing and market surveillance is performed by government agencies authorized by BIS [4].

2) Telecom and SAR Enforcement: DOT is the enforcement authority for wired and wireless telecom products, as well as the new SAR requirements [15]. The Licensing and Regulation branch of WPC performs market surveillance and enforcement activities related to regulated spectrum [8]. All other aspects of telecom enforcement are directed by TEC, performing market surveillance and reviewing renewal applications to insure compliance [7].

E. India Recommendations

Difficulties in clearing customs is one of the most common issues in India. Without the proper importation paperwork and certifications, significant delays can keep products from reaching consumers. Understanding this critical process and the specific requirements will definitely pay off [18].

Hiring an experienced customs agent is recommended, who can insure proper documentation for customs, and expedite customs clearance. A local agent can also provide schedules for customs clearance, as times can fluctuate during the year.
international code system for harmonized standards used by such standard bodies as the IEC [19].

The current Chinese EMC Standard is GB 9254:2008, implemented in 2009, titled “Test Method and Limits for Radio frequency disturbance from ITE. This standard includes requirements for testing at the highest frequency above 108 MHz, and the testing of Telecom ports [22].


2) MII Regulations: The MII has two departments to handle telecommunication and radio-communication equipment. The TAB Certification Center processes Network Access License (NAL) applications, and the SRRC takes charge of radio type approvals.

China's MII stipulates the TAB agency is in charge of developing telecom product approval regulations required to obtain the MII NAL approval. These regulations are in effect to ensure that telecommunications products operate correctly when connected to the national infrastructure, and that they do not constitute a risk to the safe and proper operation of the networks to which they are connected. MII has three categories of telecom equipment, which cover 28 types of products. Each type will have a specific set of regulations and criteria that must be met to obtain approval [19], [21].

Also under the authority of MII, SRRC is in charge of radio type approval regulations required for SRRC Radio Type Approvals. There are three categories of approvals, ten for Category I Wireless Base Stations, five for Category II Microwave Communications Equipment, and twelve for Category III Short Range Devices [19], [21].

C. China Certification

Currently there are three major certification systems in China for electronics and telecom equipment. Those are the China Compulsory Certification (CCC Mark) under the CNCA, Radio Type Approval (RTA) under MII State Radio Regulation Committee, and the Network Access License (NAL) under the MII Telecom Administration Bureau.

1) China Compulsory Certifications: CNCA accredits CCC Certification Bodies, who are then authorized to issue CCC certificates. Under CNCA, there are three certification organizations: China National Accreditation Board for Certifiers (CNAB), China National Accreditation Board for Laboratories (CNAL), and China National Auditor and Training Accreditation Board (CNAT). CNAB has accredited nine certification bodies, all of which are in China. Each is accredited and authorized to certify particular types of products and issue the CCC Mark [19], [20].

A CCC certification body is not allowed to perform CCC testing. All CCC testing must be performed at CNAL-accredited test laboratories. CNAL has accredited 882 testing laboratories in China, each of which is accredited for CCC testing on certain types of products. Because CNCA has not achieved any mutual recognition agreements (MRA) with any other accreditation body, CCC testing must be performed at CNAL-accredited laboratories in China [40], [41].

The CCC Mark requires the following steps to be taken to accomplish the whole process [19], [20]:
- Application to a CNCA-accredited certification body
- Sample testing at a CNCA-accredited test laboratories
- Factory inspection by certification body engineers
- Verification of remittance of CCC certification fees, including fees for application, testing, and inspections
- Granting of CCC certification by the certification body
- Purchasing the CCC Mark product label (CCC stickers) or applying for permission to print CCC labels

All applications must be made using the standard form or electronically with a Declaration of Conformity to Chinese standards. The application must be in Chinese [19], [20].

Sample testing includes safety and EMC testing. For safety testing, China, a member of the CB Scheme, accepts CB Test Reports with China deviations. If the CB report does not cover China deviations, additional safety testing will be performed in accordance with Chinese standards. For EMC testing, a CNCA-accredited lab will be assigned by the certification body to perform EMC tests according to Chinese standards.

If a factory has never been inspected under either the CCIB or CCEE systems, factory inspection is mandatory before a CCC Mark is granted. The certification body assigns a technical engineer and a quality assurance engineer to inspect the facility. Details of factory inspection criteria are defined in the official publication of CCC Implementation Rules for each category of products [19], [20].

Fig. 7. China EMC & Product Safety Agency Structure

1) China Compulsory Certifications: CNCA accredits CCC Certification Bodies, who are then authorized to issue CCC certificates. Under CNCA, there are three certification organizations: China National Accreditation Board for Certifiers (CNAB), China National Accreditation Board for Laboratories (CNAL), and China National Auditor and Training Accreditation Board (CNAT). CNAB has accredited nine certification bodies, all of which are in China. Each is accredited and authorized to certify particular types of products and issue the CCC Mark [19], [20].

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Fig. 8. China Telecom Agency Structure

2) MII Network Access License: TAB, under MII, takes charge of telecom approvals granted in the form of a NAL.
Each type of approved product will be issued a Network Access Identifier (NAI) with the certification number. The product must be submitted under the proper MII category of telecom equipment, covering 28 types of products. All regulated products must be approved for the NAL by MII before entering the Chinese market. MII has authorized ten laboratories to perform NAL testing. Each lab focuses on certain types of products. It is important to note that these labs may not be CNCA accredited, and currently MII and CNCA still operate under different certification systems [19], [20].

An applicant for an NAL must be a legal entity located in mainland China. There are typically four types of applications: renewal, regular equipment, high-end equipment, and equipment modification. The whole process varies based on the type of application. Due to the complexity of the process, manufacturers should seek consultation from professional approval agents before proceeding [19], [21].

In general, the items included in an application package will include the following [19], [21]:
- TAB NAL Application Form
- Business License of Applicant
- Power of Attorney for Local Representative
- Description of manufacturer and local representative
- Manufacturer/Factory Quality System documents
- Equipment specifications
- Block diagrams, circuit diagrams, and assembly diagrams
- User manual and installation instructions
- Details of post-sales support program and commitment
- Photos of interior and exterior; minimum of 5 photos

The major difference between MII approval and FCC approval is that MII includes quality assurance in the approval process. Manufacturers must have a satisfactory quality system in place. If a manufacturer is not ISO 9000 certified, MII will audit the manufacturer's quality system. MII views the quality audit and technical audit as equally important [19], [21].

Testing must be performed by one of the MII-assigned labs in China. Testing can be performed in the customer's lab under special arrangement; the tests must be performed and reported by MII-assigned labs. Test reports not from MII-assigned labs are not accepted. Most Chinese standards are similar to international standards, but written in Chinese. It is important to fully discuss the test scope, number of samples, test specifications, procedures, and test costs with the assigned test lab, prior to starting the test process [19], [21].

NAL testing includes telecom specifications and functional testing. It is important to note Chinese telecom specifications can be very different from international standards. It is highly recommended that manufacturers utilize a Chinese approvals consultant to fully understand the test specifications before starting the MII approval process [19], [21].

It is important that manufacturers apply for renewal of the NAL at least three months prior to its expiration. If the renewal application is submitted after the NAL has expired, the manufacturer must repeat the entire process [19], [21].

3) MII SRRC Radio Type Approval: SRRC is the MII agency for radio type approvals, and in-country testing is mandatory. Test cost is determined by SRRC and charged by the test labs. The application process and documentation for radio type approval is very similar to that of the NAL application, including quality criteria [19], [21].

One major difference is the sampling procedures between NAL and RTA. For all types of radio equipment, manufacturers are required to provide 20 sequential serial numbers of the product, then the test lab randomly chooses one or more units to test [19], [21].

There are three categories of approvals: Wireless Base Stations, Microwave Communications Equipment, and Short Range Devices. SRRC also regulates the technical specifications for each type of radio equipment, such as frequency range, output power, and spurious emission. Also, SRRC certificate will include a listing of the standards on which the radio equipment was tested [19], [21].

Because both NAL and RTA programs are under the MII agency, the approval process and application package are similar for both, as discussed in the previous "MII Network Access License" section. However, it's worth mentioning that although SRRC is in charge of the application and certification of MII-regulated radio equipment for type approvals, manufacturers should be aware SRRC is also responsible for radio spectrum management and monitoring.

Besides radio type approval, SRRC has another regulation, called the Radio Equipment Importation Permit. For all radio equipment, an SRRC importation permit is required when products are shipped into China. Previously this was not strictly enforced, but now customs checks for these permits when radio products enter China. Even if the radio equipment is not in a SRRC regulated category, and exempt from type approval, if it is for sale in China, an importation permit is still required for customs clearance [19].

It is very important to note that some radio devices are also subject to Network Access License. If this is the case, safety, EMC, telecom, and RF testing are all required [19], [20], [21].

D. China Enforcement

Both CNCA and MII have enforcement agencies, and criminal findings will be turned over to law-enforcement agencies. Market surveillance and auditing is performed to insure continued compliance, and customs, retail outlets, and manufacturers in China are all subject to this oversight, and can be required to provide test samples [19], [20].

The laws and regulations in China must be absolutely followed, as penalties for non-compliance can be very harsh. In addition to monetary penalties, criminal charges can be filed in cases of human health or safety, up to and including the death penalty. The court system is China is very different from most western countries, and the right to appeal is not always allowed. Since these regulations are based on federal laws, enforcement is by federal authorities. In addition to charges against the local company representative in China, company officers can be held liable, and company assets can be seized and forfeited to pay off civil penalties [19].

E. China Recommendations

Navigating the regulatory landscape is very difficult, unless you obtain the services of a knowledgeable regulatory
consultant in China. Who you hire is critical, because they will be operating as an authorized representative of your company in China, with the power of attorney that is provided for the application process. Spending the time to find a reputable agent with experience in your company’s product categories will be well worth the investment [19].

In addition, procuring the services of an experienced customs expert is highly recommended. Clearing customs in China can create customer fulfillment and supply management issues, an important area for global firms. Replacement part regulations are another confusing area. Generally, separate certifications are required if a part also falls into a certification category, e.g. power supplies for ITE [19].

IV. CONCLUSION

After completing these articles, it may seem like the obstacles are insurmountable, but take courage from the fact that many have completed this quest. Over time the agency processes have become more streamlined in these countries, and international standards continue to be the models for their own regulations. Having identified the major legislation, regulation, and certification programs for BRIC countries, as well as the types and methods of compliance enforcement, the authors have made recommendations specific to each country, to help expedite and streamline the approvals processes, and to help insure successful certification for electronic products.

Please note that the content in this paper should not be the only information you use when submitting for certification. Official standards and regulations should be procured for each country, and the services of an experienced regulatory agent should be utilized if in-house expertise is not available. Customs consultants can be a valuable information source on importation, in addition to the services mentioned previously.

Finally, engineering and regulatory compliance affinity groups are an invaluable resource in staying current on changes and modifications to compliance regulations and processes for BRIC countries. The local chapters of the Institute of Electrical and Electronics Engineers (IEEE) [24], such as the IEEE EMC Society [25] and the IEEE Product Safety Engineering Society [26], provide presentations and networking opportunities with compliance engineers on the changing certification requirements. In addition, social media site LinkedIn has a wealth of different compliance related groups you can join at no cost, such as “International Approvals/Certifications”, where the latest news on BRIC and other countries regulatory criteria is shared with members [27].

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