International Competitive Bidding For New Generation Capacity: The Malaysia's Experience

Aizuddin Mohd Sopian, Joon B. Ibrahim, *Member, IEEE* and Nor Ziha Zainol Abidin
Single Buyer Department, Planning Division
Tenaga Nasional Berhad
Kuala Lumpur, Malaysia
aizuddinms@tnb.com.my, jooni@tnb.com.my, norziha@tnb.com.my

Abstract—The implementation of International Competitive Bidding (ICB) for new generation capacity in Malaysia marks an important milestone in creating a competitive and equitable generation sector of Malaysia Electricity Supply Industry (MESI). The ICB exercise is a testimony to the government's commitment to create transparency in the lucrative generation sector while driving down the cost of electricity to the consumers. This paper discusses the practice of ICB in Malaysia. It begins with the development of MESI followed by the Generation Expansion Planning (GEP) process in identifying shortfall in generation capacity. The paper then highlights the milestones in the implementation of ICB. The discussion continues with major factors that shape the implementation of ICB and their impact to both GEP and ICB exercise.

Keywords—generation expansion planning; International Competitive Bidding; electricity industry reform

I. INTRODUCTION

Malaysia, a country in South East Asia, comprises of Peninsular Malaysia and Sabah and Sarawak in the Borneo Island. The country is categorized as an upper middle-income nation with Growth Domestic Product (GDP) of 5.6 percent as of 2012. The country aims to attain the status of a high income developed nation by 2020 fueled by the government's Economic Transformation Programme (ETP) [1]. Undeniably, a reliable and safe supply of electricity in the country plays a major role in ensuring the success of the ETP implementation.

Currently, the installed capacity in Peninsular Malaysia stands at around 21.5GW to cater for the peak demand of around 16.5GW in 2013. The capacity is contributed mostly by gas-fired plants at about 58% (open cycle gas turbines and combined-cycle plants), coal-fired plants at 33% and the rest are from hydro and other small scaled renewables. Out of the total, 51% is owned by Tenaga Nasional Berhad (TNB), while 38.5% is produced by Independent Power Producers (IPPs) and the remaining 13.7% is co-owned by TNB and the IPPs.

The increasing demand of electricity coupled with retirements of ageing power plants will definitely require planting-up of new power plants in the future. As the generation sector offers a lucrative return to the investor, this segment of electricity value chain has invariably attracted many interested parties to get its share of the pie. Hence, in the effort to create a level playing field and in line with the government's aspiration to achieve a high performing electricity industry, the MESI key reform initiatives have been formulated to among others promote competition in the generation sector. These initiatives, namely the competitive bidding for new plant-ups (i.e. the ICB), and the establishment of the ring-fenced Single Buyer are the evidence of government's commitment in ensuring a reliable, high-quality and cost effective electricity supply to the nation [2].

II. OBJECTIVE

The intention of this paper is to highlight the ICB exercise in Malaysia and discusses the outcomes emerge from the new practice. The paper also discusses the development of MESI that leads to the implementation of ICB. Major factors that shape the implementation of ICB and how the factors may impact the current and future practice of ICB are deliberated.

III. BACKGROUND

Before embarking on the topic of ICB, it is important to gain some insight into the background of MESI. This section describes the regulatory framework of MESI and the roles and responsibilities of related agencies. Finally, the process of identifying the need for new capacity is also explained.

A. MESI Regulatory Framework

The electricity supply chain in Peninsular Malaysia is dominated by TNB. TNB, being a vertically integrated utility, is seen as a monopoly in MESI. However, the introduction of the IPPs in 1993 following a major blackout in 1992 has created some level of competition in the power generation sector. Nonetheless, there is no competition in other aspect of the electricity supply as TNB fully controls the electricity business from transmission down to distribution and retail [3].

The attempt to restructure MESI began way back in the 90's but was quite lacking in the initiatives. However, only

recently the government has taken a profound move which saw the implementation of a holistic reform package to transform MESI from traditionally a regulated monopoly to a multiplayer industry. MyPOWER Corporation was set up by the government in 2010, to analyze the power industry structure and make recommendations. MyPOWER is a special purpose agency, whose task is to detail out key reform initiatives for the Malaysia's electricity supply industry that are aligned with the government's Economic Transformation Programme [4]. The reform initiatives were aimed to enhance transparency and extract efficiency from the industry in order to deliver reliable yet cost-efficient electricity. Among the initiatives are the introductions of competitive bidding for securing new generation capacity and ring-fencing of Single Buyer within TNB for greater transparency in procurement and dispatching of the electricity.

The next section discusses the role and function of each entity responsible for the entire chain of generation expansion planning (GEP).

B. Major Players in GEP

Essentially, there are two pivotal entities responsible in planning and contracting for new generation capacity; the Single Buyer (SB) and the Energy Commission (EC). The roles and obligations of these entities are clearly stated in the Single Buyer Rules (SBR), a set of rules that governs the operation of Single Buyer market and the conduct of its participants [5].

SB is responsible for forecasting of electricity demand and planning for generation capacity. EC, on the other hand, is entrusted to acquire the new generation capacity based on the shortfall identified in the Generation Expansion Planning (GEP) study submitted by SB which currently resides under TNB. The entire process in contracting for new capacity is described at length in the next section.

C. The Process of GEP

The GEP begins in SB with the forecast of electricity demand followed by reliability assessment to determine if and when the new generation is needed as well the type of generation plant to be acquired. The next step is the selection of optimal capacity expansions based on economic considerations. Once the GEP is endorsed by an approval committee, EC will assess the requirement for additional capacity and began with the tendering process for new generation capacity. These processes are discussed below.

1) Electricity Demand Forecast

The electricity demand forecast is the most critical parameter in the GEP. The output of this study serves as indicator to the timing of future generation capacity investment. The factors that influence the outcome of the forecast include the economic growth, population and dwelling growth, major industrial and commercial developments and any other economic, social, Government policy or commercial factors that may impact the electricity consumption growth in Peninsular Malaysia. Annually, SB publishes a Five and Ten Year Demand Supply Forecast Report and submitted to EC for approval to be used for the GEP.

2) GEP Study

Generation expansion planning (GEP) refers to a long term planning of generation capacity availability to ensure reliable supply of electricity in the future. The objective is to plan for least cost capacity addition to the system based on the input and constraints that will shape the outcome of the study. The output of the study will be the basis for determining when and what type of power plants to be built in the country.

Although the study of GEP is done by SB, the decision-making activities are carried out by an approval committee, known as JPPPET, constituted of various parties related to power industries and chaired by the Minister of Energy, Green Technology and Water. The approval committee for GEP comprises representatives from Economic Planning Unit of the Prime Minister's Office, Ministry of Finance, Ministry of Natural Resources and Environment, Ministry of International Trade and Industry, State of Sabah's Economic Planning Unit, Ministry of Public Utilities Sarawak, the Energy Commission (EC), Construction Industry Development Board (CIDB), TNB, PETRONAS (National Petroliam Company) and Sabah Electricity Company (SESB) [6]. The GEP study by SB is presented to the committee twice every year or as when requested by the government or EC.

3) Contracting for New Capacity

The task to contract new generation capacity lies within the regulator-the EC. As spells out in the Single Buyer Rule, upon submission of the GEP studies by SB, EC is responsible to assess the shortage in the generation capacity based on the GEP study. If there is a requirement for additional capacity, EC will subsequently initiate the tendering process, as well as develop requests for tender. Next EC will assess the offer made by the bidders and finally select the winning bid for the Government's endorsement [5].

The Energy Commission has successfully completed the first and second ICB exercises and was well received by the industry players. The third ICB exercise has already begun and the result is expected to be released by end of 2013. The next section highlights the practices of acquiring new capacity prior to ICB and followed by a section to describe in detail the Malaysia's experience in all ICB exercise.

IV. PRE- ICB

TNB was known as the National Electricity Board (NEB) prior to its privatization in 1990, a fully owned government power authority. The GEP as well as the planting up for new capacities were under the jurisdiction of NEB. After the privatization, TNB continued with the study of GEP but approval for implementation of new generation capacity was carried out by the government through the Economic

Planning Unit of the Prime Minister Office. Nonetheless, all generating plants were owned and operated by TNB.

However, after a major blackout in peninsular Malaysia in 1992, the government has aggressively pushed for the IPP program. It was during this time that the Malaysian economy was booming and the peak demand was steadily growing at an average rate of 8.5 percent annually. The government was concerned that TNB would not be able to cope up with the demanding rate of electricity demand. As such, the government had indicated for more players in the power generation sectors [7].

The first five IPPs in the country are YTL Power, Malakoff, Genting Sanyen, Powertek and PD Power Berhad. The five projects were given monetary incentives to finish on a fast-track basis and managed to supply a total of around 4GW by 1996. The companies behind the first five IPPs were major players in the Malaysian economy. As such, there have been perceptions that the IPP licenses were given to politically well-connected companies. These companies were given favorable rates that caused strained to TNB's profitability. It was reported that their internal rate of return's (IRR) are expected to be between eighteen and twenty-five percent. Unfortunately, after the completion of the first wave of IPPs, the region was hit with financial crisis. The electricity demand contracted and the power sector ended up with a very high reserve margin of about 55 percent which put more strain to TNB [7] [8].

The Energy Commission (EC) was established in 2001 with the responsibility to regulate the energy sector mainly the electricity supply and piped gas supply industries in Peninsular Malaysia and Sabah [9]. Later the approval committee known as JPPPET as described earlier was formed to make decision on the planting up. In the same year, as the economic state of the country recovered, the requirement for new power plants resurfaced. The subsequent IPPs in the country were granted to companies that are entrusted by the federal government through direct negotiation between the IPP and TNB under scrutiny of EC. Fortunately for TNB, the Power Purchase Agreements (PPAs) signed with the second and third wave of IPPs are more favorable to TNB taking into the considerations the painful experience with the first wave of PPAs [7].

In 2010, when MyPOWER Corporation was set up to analyze the power industry structure, they made some recommendations as key reform initiatives for the MESI. One of the main suggestions in the MESI reform is to initiate the ICB practice which will be discussed in the next section.

V. International Competitive Bidding

A. Development of ICB

The catalyst for ICB is the need for new capacity in the future. The quantity of capacity in MW is supplied by the GEP study which was endorsed by the aforementioned committee. Since the process of ICB will take several years to complete, capacity that are required urgently will undergo restricted bidding process or direct negotiation. Other mitigations include the extension of existing power plants, shifting of schedule maintenance for power plants and arrangement for power imports from interconnections. As such, the earliest ICB that was carried out is for capacity needed in 2016. Year 2016 is a critical year for the electricity industry as all the first generation Power Purchase Agreements (PPAs) and several of TNB plants' Service Level Agreements (SLAs) would be expiring. EC has announced in the beginning of 2012 that a total of 4,500MW of power generation was up for bidding and the exercise will be done in stages [10].

B. ICB Track 1

The first competitive bidding exercise was carried out to build and operate a new combined-cycle power plant at a predetermined site at the northern part of the Peninsular Malaysia (i.e. Prai) by 1 March 2016. The site, currently owned by TNB, was previously used for power plant which has been cleared and will be leased to the winning bidder. The site was identified to be able to cater for the advertised capacity based on a joint study done by TNB and EC.

In January 2012, EC published an advertisement in five local dailies and their website for an expression of interest from local and foreign parties to build a capacity between 1,000MW to 1,400MW. EC then released an official letter instructing each of the 47 interested parties to purchase the Request for Qualification (RFQ) documents to be considered in the bidding process. 17 RFQ documents were submitted and 9 were shortlisted [11]. Later, the nine shortlisted bidders were required to purchase the Request for Proposal (RFP) documents and to return the documents stating their offers by 16 July 2012 [12]. The winner was announced by EC on 9 October 2012. The winning bidder is TNB who has been offered to build, own and operate a combined cycle power plant of 1,071 MW to be commissioned at a levelised tariff of 34.7 sen/kWh [13]. The capacity is achievable with a combined cycle power plant that use 2 units of Siemens H-class gas turbines expected to have efficiency of around 60% Based on this experience, the first ICB exercise took about 10 months to be realized.

C. ICB Track 2

The ICB Track 2 was carried out concurrent with the ICB Track 1. Track 2 was referred to as "Renewal of Existing Power Generation Facility" and offered only to first generation power plants which were scheduled to retire between year 2015 and 2017. The main prerequisite to be considered for renewal is the commitment of the power plants to reduce their current commercial rates stated in the existing PPAs. The new rates will take place after the expiry of the current PPAs. The qualified participants that were interested in this exercised are as shown in Table I [14]:

Out of the 11 bidders, only 3 bidders were offered for renewal. The winning bidders were announced on 9 October 2012, at the same time as the announcement for ICB Track 1 result. The winning bidders are listed in Table II [13]:

TABLE I. BIDDERS FOR ICB TRACK 2

No	Qualified Participants	Existing Facility (Existing Site)	Existing Capacity (MW)
1	YTL Power Generation SdnBhd	Paka, Terengganu	780
2	YTL Power Generation SdnBhd	Pasir Gudang, Johor	390
3	GentingSanyen Power SdnBhd	Kuala Langat, Selangor	720
4	Segari Energy Ventures SdnBhd	Lumut, Perak	1303
5	Port Dickson Power SdnBhd	Tanjung Gemuk, Port Dickson	436
6	PowertekBerhad	Teluk Gong, Malacca	434
7	TNB	Connaught Bridge (Open Cycle)	478
8	TNB	Paka	999
9	TNB	Pasir Gudang (Combined Cycle)	249
10	TNB	Pasir Gudang (Open Cycle)	205
11	TNB	Serdang (Unit 1, Unit 2 and Unit 3)	326

TABLE II. WINNING BIDDERS FOR ICB TRACK 2

Bidder	Capacity, levelised tariff and period
Genting Sanyen Power	675 MW; levelised tariff 35.3 sen/kWh for 10 years
Segari Energy Ventures	1,303 MW; levelised tariff 36.3 sen/kWh for 10 years
TNB Pasir Gudang	275 MW; levelised tariff 37.4 sen/kWh for 5 years

The levelised tariff in both Track 1 and Track 2 bidding exercises were derived by using projected 2016 market gas price of RM42.24/GJ. Currently, the gas for the power sector in the country is partly subsidized and will assume full market price by 2016.

D. ICB Track 3

The third ICB exercise comes in two packages; Track 3A and Track 3B [15]. The first package, Track 3A, is the construction of a coal plant at a brownfield site with a capacity of 1,000MW. The brownfield site refers to a site adjacent or near an existing interconnection facility or substation. Due to the tight timeline of which the target commissioning date for Track 3A is by October 2017, EC has decided that any proposal involving wayleave application will not be accepted.

Meanwhile, Track 3B entails the construction of coal-fired plant at a greenfield site with a total capacity of 2,000MW. The Greenfield site refers to a new site where bidders will be responsible to identify and secure an appropriate site. The package is an open tender that requires the construction of the interconnection facility and acquisition of wayleave. The project requires the winning bidder to construct transmission line to either one of the six approved nodes along the 500kV Grid through which power will be injected. The nodal points were provided by EC through a study done by TNB. The target commissioning dates for the capacity are October 2018 for the first 1,000MW and another 1,000 MW by April 2019.

The process for both Track 3A and Track 3B started on 18 Dec 2012 when EC invited companies to submit their RFQs [15]. Although 30 companies submitted their RFQ, only two companies were shortlisted for Track 3A. The shortlisted companies were announced on 7 February 2013 are TNB and 1Malaysia Development Bhd (1MDB) with their respective foreign partners. TNB has proposed to build the plant in Manjung, Perak where 3 units of its coal plants (3 units of 700MW) are operating and currently building the fourth coal unit (1,000MW) which is expected to be commissioned by 31 March 2015. The Manjung site can cater for another 1,000MW which will be the fifth unit. On the other hand, 1MDB has proposed to build the proposed capacity on its existing Jimah site, which currently has 2 units of coal plant (2 units of 700MW). The Jimah site has ample land to accommodate up to 2,000MW in additional capacity. The two consortia were required to submit their RFP by 20 May 2013. It has been reported that TNB submitted a bid of 22.78 sen/kWh, two sen below 1MDB's 24.86/kWh [16]. The result for Track 3A is expected to be announced in July 2013.

Meanwhile, on April 2013, EC has shortlisted 5 consortia for Track 3B based on their proposed sites as shown in Table III [17]. The consortia will need to submit their RFP documents by 30 September 2013. The result is expected to be announced before the end of the year.

TABLE III. SHORTLISTED BIDDERS FOR ICB TRACK 3B AND THEIR PROPOSED SITES

No	Short listed bidders	Lead member	Proposed site
1.	1Malaysia Development Bhd; and Mitsui & Co. Ltd.	1MDB	Jimah, N.S. (Injection at OlakLempit)
2.	Formis Resources Berhad, SIPP Energy SdnBhd, Posco Energy and Posco Engineering & Construction Co. Ltd.	Formis	TanjungTohor, Johor.(Injection at Yong Peng East)
3.	TenagaNasionalBerhad, Global Power Ventures SdnBhd and China National Machinery Import & Export Corporation.	TNB	TanjungHantu - Segari, Perak. (Injection at Terong, Bruas)
4.	Malakoff Corporation Berhad and Sumitomo Corporation	Malakoff	Pulau Carey, Selangor. (Injection at OlakLempit)
5.	YTL Power International Berhad and Ranhill Power Sdn Bhd.	YTLP	TanjungTohor, Johor. (Injection at Yong Peng East)

VI. DISCUSSION

A. Experience From Recent ICB Exercises

Based on the recent ICB exercises, the bidding process will take about 10 months to be completed. Then the construction time given for the CCGT in the first ICB is about 29 months. Nonetheless, the pre-tendering process involving the decision making and preparation for the bidding process may easily take another 5 months which result in the total lead time for the CCGT around 3 years. As such, any change in the demand forecast which requires fast-tracked construction of power plants would not be favorable for ICB exercise.

Competitive Bidding is a form of competition that invites various companies to submit bidding for the project. Since the lowest bid will win the project (as long as they adhere to the technical requirements), companies are encourage to offer their lowest price. Based on the analysis carried out by SB, the average generation cost per unit by the plants selected through the ICB Track 1 and Track 2 is lower by 29% than the first generation of IPPs, 20% lower than the second generation IPPs and 19% lower than the existing TNB's gas-based thermal plants [18].

For ICB Track 3, it is expected that companies with refutable name and backed by the government will manage to offer lower price due to their ability to benefit from low interest rates for their loans from financial institution. Many analysts believed that companies such as TNB and 1MDB will be a favorite in the ICB Track 3 exercises because of their status as government linked companies hence the favorable leverage to government-backed bond or loan [19].

B. Major Factors Influencing The ICB

1) Electricity Demand Forecast

The most important parameter to be considered in GEP is the demand of electricity. It will decide whether the current supply of electricity is sufficient or otherwise. The forecast of electricity depends tremendously on the economic outlook of the country which is reflected in the Gross Domestic Product (GDP) growth projection. High GDP growth projections simply imply high growth in electricity demand. The value of GDP growth projection is decided after thorough analysis of various sources such as analysis from investment banks, central bank and international banks. The maximum demand in Peninsular Malaysia is expected to reach 17 GW by year 2014 and expected to grow at a rate of between 2% to 4% annually.

The effect of energy efficiency improvements and substitution effects due to co-generation or demand side management on the three main sectors, namely industrial, commercial and domestic consumers is also taken into consideration when preparing for the electricity demand forecast. In this case, a reduction rate of 0.7% is imposed from growth each year from the base projection year and will accumulate over the years which would result in effective reduction in demand in the long run.

Uncertainties such as economic crisis, political crisis, natural disasters and climate change can easily skew the electricity demand forecast hence the GEP outcome. For example, the economic boom in 1990s had led to few power plants to be built as fast-track basis. One such plant was Genting Sanyen Power Plant which contract was awarded in January 1994 and commenced operation in March 1995 as open cycle units initially and as combined-cycle plant one year later with a total capacity of 720MW [20].

Undeniably, the bidding capacities offered in the ICB are derived from the projected demand. Any major revision in the demand forecast may impact the current ICB decision. If demand slows down due to economic downturn, the country may face with high reserve margin as the contracted capacities are completed on time. Alternatively, if demand surges, the country will need to issue fast track ICB exercise or settle for direct negotiation of power plant construction or power purchases from interconnection such as Singapore or Thailand.

2) Existing Generating Capacity

The available capacity in the system is compared to the demand forecast in order to decide for the earliest addition of capacity into the system. Currently, the installed capacity in Peninsular Malaysia stands at around 21.5 GW which makes the reserve margin available in the system in 2013 about 34%, an excess capacity of 5.5 GW. This capacity is contributed mostly by gas-fired plants at about 58% (open cycle gas turbines and combined-cycle plants), coal-fired plants at 33% and the rest from hydro and other small scaled renewable. However, based on fuel availability and least cost operation, the generation in 2012 is shown in the following figure [21].

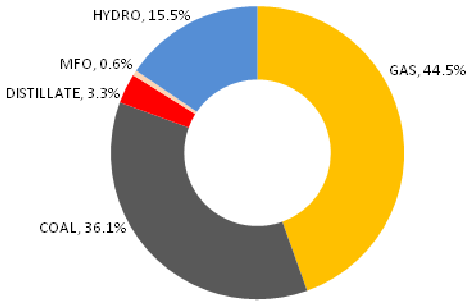

Fig. 1. Generation Mix in Peninsular Malaysia 2012

Existing capacity in the system may be extended as seen in ICB Track 2 exercise. The capacity being offered for bidding should be less than the total capacity of the retiring plants in order to force bidders to offer their lowest price. There would be no motivation for the bidders if they know that all existing capacities are needed by the system. For instance, in the ICB Track 2, the offered capacity for extension is only slightly more than 2,000 MW while the

total retiring capacity scheduled between 2015 and 2016 is more than 6,000 MW. As such, the qualified bidders would need to offer competitive price in order to be considered for extension.

With proper maintenance, power plant should be able to operate beyond their design operating life. Some plants such as the open cycle gas turbines (OCGT) are only lightly operated as their main function is to serve the peak load which only happens for few minutes a day. Nonetheless, some plants running as the base load may not deteriorate as much because they run continuously without the need to start and stop in a frequent manner.

3) Government Policy

Numerous possibilities can be explored when deciding for future addition to the systems. Some technologies are readily available in the market while others are still in the developing stage. It is the common practice to consider only technologies that are proven and available in the industries to ensure that spare parts and expertise are accessible as and when needed. The technology options that can be considered for future plant-up are OCGT (Open Cycle Gas Turbine), CCGT (Combined-cycle gas turbines), coal power plant, hydro electric power plant, imports of electricity from other systems, co-generation plants, renewable energy, demand side management and nuclear power plant. These options are subjected to constraints such as fuel availability, site availability and fuel price. Among the examples given, government policy can easily alter the current circumstances.

For example, a nuclear power plant that was considered as an option beginning from year 2021 by a GEP study may not be viable in another GEP study that is carried out a year later. In that study, nuclear option may only be considered post 2025 due to change in government policy. Nonetheless, nuclear power plant would not be subjected to ICB as the project is critical and requires government backed agreement between the parties involved such as regulatory, fuel arrangement, public acceptance and financial assistance.

As Malaysia is currently a net exporter of natural gas, the power sector industry has been relieved with subsidized gas price in order to keep the electricity tariff low. However, the government is removing the subsidy gradually aiming to fully utilize full market price by 2016 [22]. According to the least cost capacity planning of GEP, gas would no longer be the favorite choice for electricity generation but we may expect more generation from coal in Malaysia in the future since the current market price for coal is lower than gas.

Government policy undeniably is the most important factor shaping the ICB exercise. The decision to start the ICB practice was initiated by the Government through its agency, MyPOWER Corporation which was set up in early 2010 recommend key reform initiatives for the Malaysia's electricity supply industry that are aligned with the government's Economic Transformation Programmes.

VII. SUMMARY AND CONCLUSION

The implementation of ICB has provided a platform for industry players in the power sector to compete in constructing and operating new power plants in the country in a fair and transparent manner. Equally important, the ICB exercise promotes new players to bring in superior technologies which are more efficient in order to be able to offer lowest price for the bidding. As a result, the consumers will be able to enjoy competitive electricity tariff but with greater quality in the long term.

The completed ICB exercises, i.e. the ICB Track 1 and Track 2 have shown some reduction in the average generation cost per unit when comparing to the existing power plants. It is expected that that the third ICB exercise i.e. Track 3 will also show similar trends. With more challenges and uncertainties expected in the future, it is imperative for all parties involved in the GEP and contracting of power plants to take necessary precaution to mitigate any possibility of price hike in the electricity tariff.

Nonetheless, some technologies that are too expensive to built such as renewable projects and nuclear will not be suitable for the ICB exercise. They will need strong government will to be able to co-exist with the current electricity generation.

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