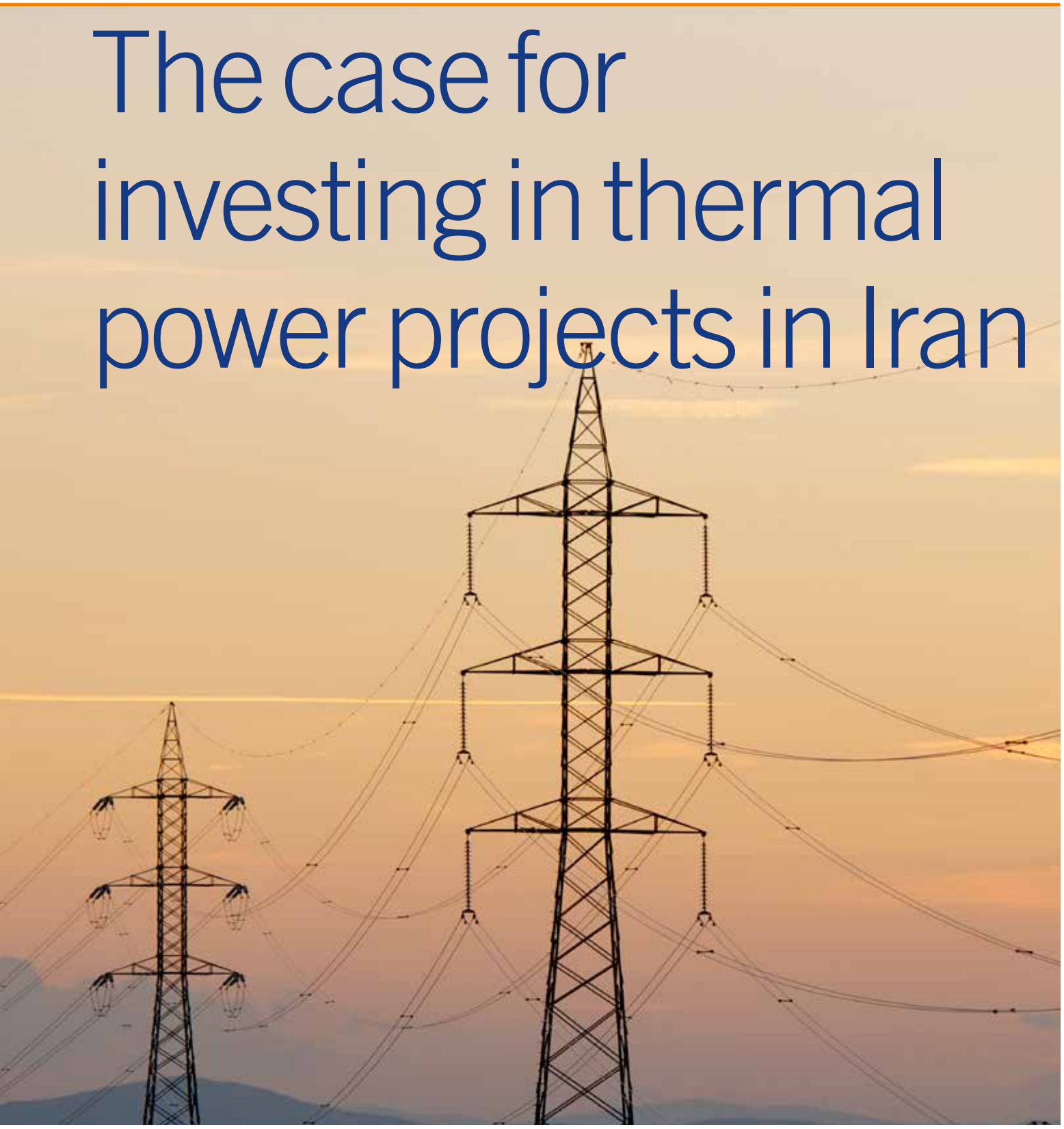
PÖYRY

PÖYRY POINT OF VIEW - DECEMBER 2016

The case for investing in thermal power projects in Iran



The potential returns are exc
time to understand the risks

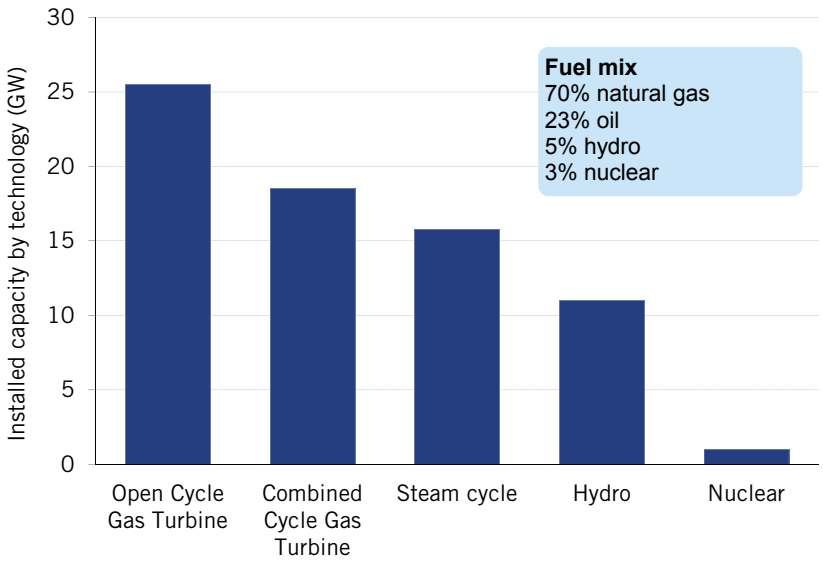
Iran is one of the Middle East region's largest economies with a population of 80 million and a peak electricity demand of 47 GW. In January 2016, the US and EU lifted a range of economic and nuclear related sanctions against Iran that had been in place since 2006 and earlier. The lifting of these sanctions has sparked renewed interest in Iran amongst power developers and investors.

We expect peak demand in Iran to grow at a rate of between 2 to 3 GW in the coming years. This will drive a need for new power capacity. In addition to this, we estimate that almost 20 GW of Iran's thermal power capacity is more than 25 years old and much of the capacity is open cycle. This capacity could be replaced or upgraded to improve efficiency and reduce gas consumption.

There is wide-spread recognition that while nuclear and renewable capacity is being considered, significant investment in new thermal power capacity is needed. 56 % of the current capacity is owned by the government at present, however going forward it is expected that new capacity will be developed by the private sector.

In June 2016, Unit International signed contracts for new thermal power capacity totalling 6 GW. This is the first investment in thermal power by an international investor in post-sanctions period. This is a significant investment but we foresee that more thermal capacity will be required in the coming years.

FIGURE 1 - ELECTRICITY GENERATION CAPACITY IN IRAN



Source: TPPH

iting but investors must take and market frameworks

In this article, we review the case for thermal power investment in Iran and find that the prospects and potential returns are exciting. The high potential returns come with risks which are greater compared to some other markets in the Middle East region. Power investors need to make a significant effort to understand these.

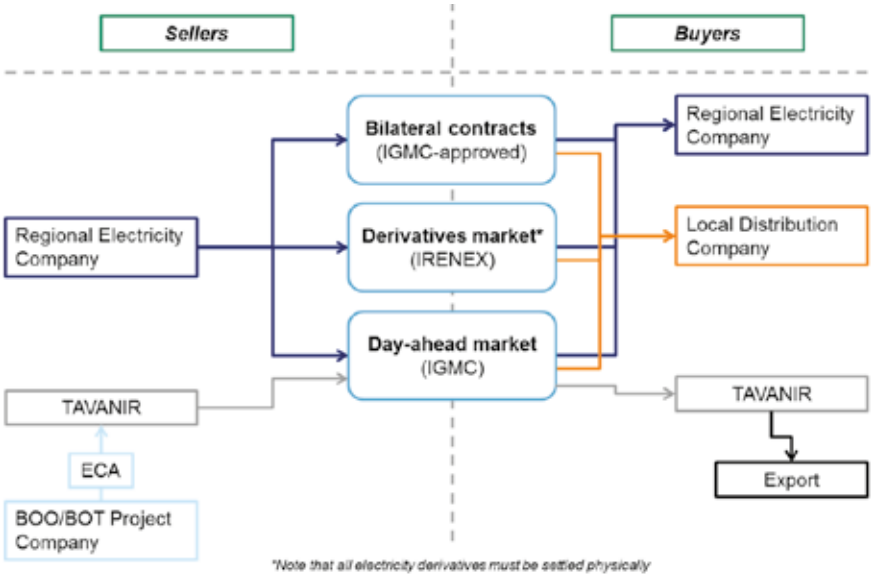
THE ISLAMIC REPUBLIC POWER POOL

The Islamic Republic Power Pool (IRPP) is an hourly day-ahead market for Iran that has operated since October 2003. It is managed by Iran Grid Management Company (IGMC) which is a subsidiary of Tavanir. The market design resembles the original pool market that was initially put in place during the liberalisation of the England and Wales market in 1990. In addition, forward power contracts can be traded on the Iran Energy Exchange (IRENEX). The IRPP is the only spot market for electricity currently operating in the Middle East region. The IRPP's successful operation for almost 13 years is a remarkable achievement and puts Iran at a level of liberalisation and institutional capacity that is well ahead of many of its regional neighbours.

The IRPP does however have some significant differences from what international investors may expect from a typical spot market. The headline market price is based on a weighted average of accepted offers and so based on average cost rather than marginal cost. The market is pay-as-bid with generators receiving their bid price for delivered energy rather than receiving a central clearing price based on the cost of the marginal generator.

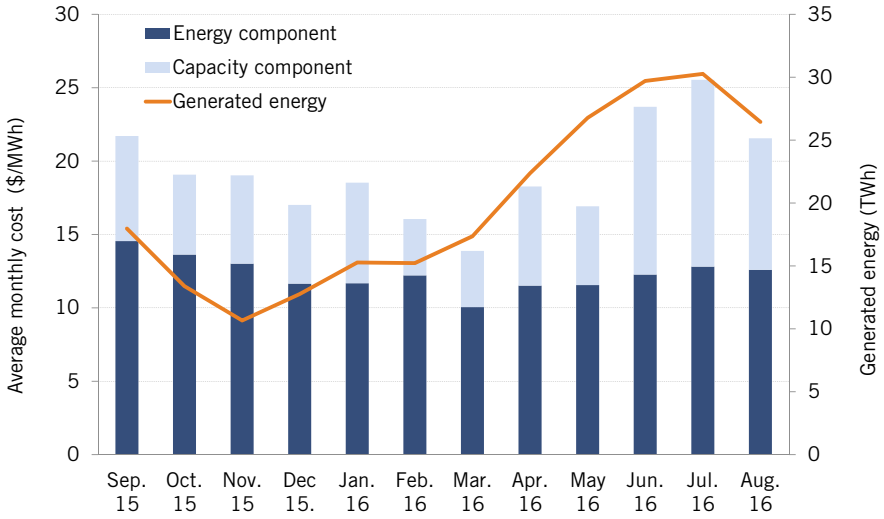
IGMC publish some limited data and information on their website so that investors can analyse and begin to understand the market prices. We believe that the IRPP's transparency could be further improved by publishing additional details on the nature of the price calculation and future expected developments in this area. This would allow investors to understand and gain greater confidence in the IRPP's operation and future trajectory.

FIGURE 2 - STRUCTURE OF THE ISLAMIC REPUBLIC POWER POOL



Source: IGMC

FIGURE 3 - RECENT PRICE TRENDS IN THE ISLAMIC REPUBLIC POWER POOL



Note: Exchange rate of 31500 IRR per USD assumed. Capacity component also includes ancillary services payments
Source: IGMC

THE TPPH ENERGY CONVERSION AGREEMENT

The Thermal Power Plant Holding company (TPPH) is a government agency which is responsible for the planning, management and development of thermal power generation in Iran.

TPPH offers a contract to new private thermal power projects. This contract is an energy conversion agreement (ECA) often referred to as a tolling agreement. The contract is notable as it differs in structure from what has become standard in most of the Middle East region for Independent Power Projects (IPPs). We believe there are two key drivers of the different approach taken by Iran:

- the relatively weaker state of the government finances means it is not desirable to make a financial commitment to a long (e.g. 20 year) PPA term; and
- the existence of the IRPP allows for a greater level of market risk to be passed to developer compared to what is possible elsewhere in the region.

The following bullet points outline the key characteristics of the ECA based on the template contract provided by TPPH along with other publications and information:

- the contract is a build-own operate (BOO) contract where the investor retains ownership of the asset after the initial contract term;
- the contract is governed by the laws of Iran;
- TPPH is responsible for supplying gas to asset during the contract term;
- the developer receives payments by monthly drawdowns against a Rial denominated Letter of Credit issued by TPPH;
- there is an option sell directly to the IRPP for part of the energy during the contract period;
- the developer must commit to a guaranteed level of thermal efficiency;
- the technology used should be a F or H class combined cycle gas turbine;
- the current contract term offered is 5 years;
- the current electricity purchase price (which it should be noted excludes the cost of fuel) offered is $26/MWh with indexation for inflation and exchange rates; and
- the electricity purchase price is paid 25% on generation and 75% on availability.

POTENTIAL RISKS

There are a number of challenges when considering an investment in new thermal power in Iran. We have identified four key challenges which are summarised below:

- **Sourcing of international finance:** The majority of sanctions against Iran have now been lifted. However, the US Treasury department continues to place restrictions on the use of dollars for transactions with businesses in Iran. This has made large international banks (all of whom will have a US presence) reluctant to lend to new projects in Iran. This drastically reduces the potential lending pool for investors.
- **Assessing potential for policy changes:** Thermal power assets have lifetimes of 25 years or more. A common concern (which is not specific to Iran) is the potential for the policy environment to change over the asset's life and for revenues to be affected as a result. A particular concern for investors will be the potential for sanctions to be reapplied (so-called 'snap-back' sanctions) should Iran be deemed not to be complying with the Joint Comprehensive Plan of Action (JCPOA) that has been agreed with the EU, US and UN.
- **Assessing future market revenues and risk:** Market risk relates to the extent to which changes that affect prices in the IRPP (e.g. system capacity margin, fuel prices, generation mix and technological improvements) can impact asset revenues. The ECA offered by TPPH substantially reduces market risk by offering a largely fixed electricity purchase price during the first five years. After the ECA contract term, the asset will rely on the IRPP for its revenue and uncertainty around revenues will be significantly higher and the market price drivers must be carefully assessed.
- **Undertaking pre-development work:** There is a greater onus on the developer to identify sites and undertake permitting compared to many other Middle East countries where the pre-development work is undertaken by a central body before the project is offered for development.

POTENTIAL RETURNS

We have used our generic project cost assumptions to analyse the potential project returns that may be on offer to investors in a new thermal project in Iran. The numbers here should be treated as highly indicative but do provide insight in to the structure of the potential returns on offer.

We believe that the key driver of project returns will be the level of market revenue received by the project after the end of the 5 year ECA. The metric of market revenue that has been used here is $/ MWh of plant availability. All monetary values and project returns are expressed on a real money basis.

Our analysis indicates that there is a floor to the project return of approximately 6% on a real, pre-tax basis. This floor level would be realised in the event of low market returns that do not justify keeping the asset operational after the end of the initial five year term. The project return increases sharply at higher levels of market revenues with a project return of 20% or being plausible in the event of high levels of market revenue.

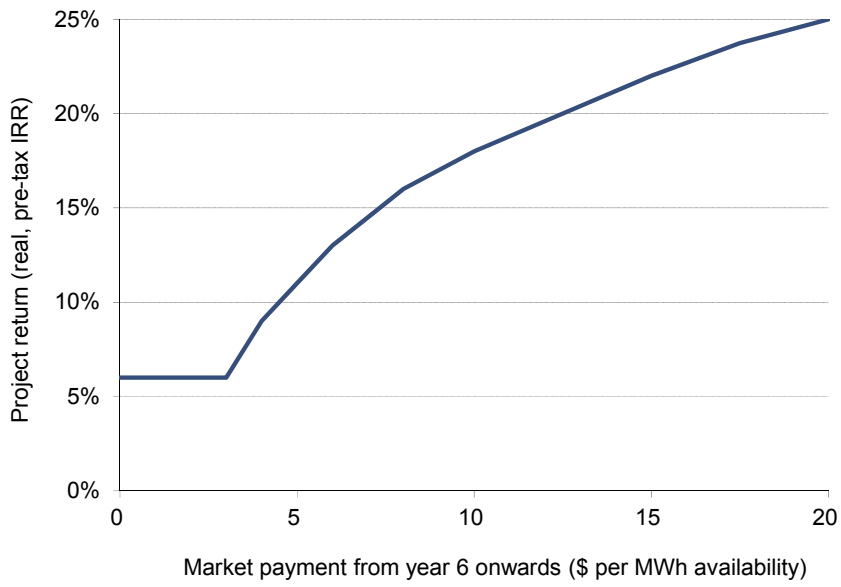
At present, we estimate that the difference between the IRPP's average electricity price and the variable costs of a new CCGT is approximately $12/MWh.

This would translate to a project return of almost 20% if that level could be realised and maintained for the project's lifetime. This analysis is clearly too simplistic and investors should consider:

- the potential for market conditions to change;
- the potential for the asset to capture a revenue which is different from the average level as a result of its operating pattern;
- the potential for the asset to receive a price above this level by bidding up to the expected cost of the marginal generator;
- the potential for the asset to receive a price below this level by being required to bid in line with its own variable costs.

The unanswered question is whether potential returns that could be as high as 20% will attract further new investment in thermal power in Iran given the uncertainties involved. Investors looking at thermal power investment in Iran will need to take time consider the risks and understand what strategies can be applied to mitigate them.

FIGURE 4 - PROJECT IRR IS HEAVILY DEPENDENT ON MARKET REVENUE



Note: Pöyry generic cost assumptions have been used

WHAT CAN PÖYRY OFFER?

The market revenue in the IRPP is dependent on:

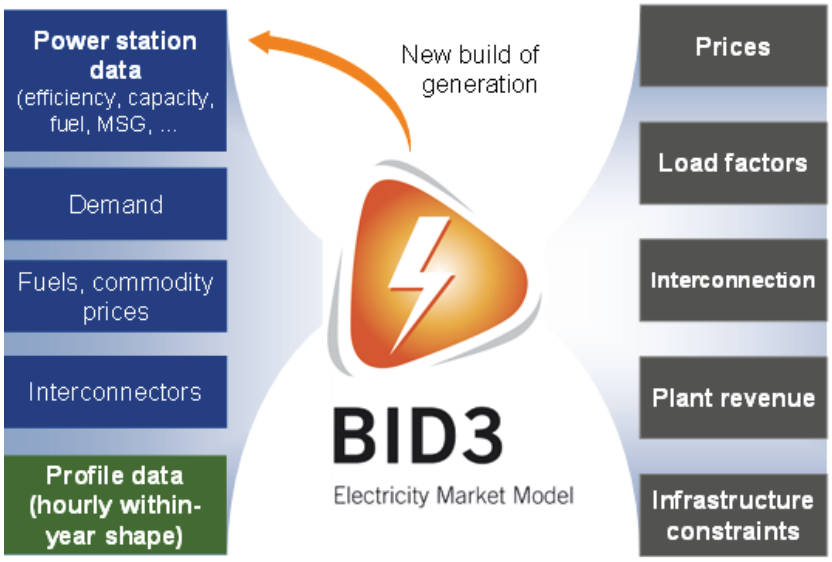
- future gas and other fuel prices;
- the future level of electricity demand;
- the future level of nuclear, wind and solar capacity;
- the future level of power exports from other countries;
- the efficiency and quantity of other thermal capacity; and
- the market price formation mechanism.

Pöyry has developed a model of the IRPP using its internationally recognised BID3 electricity modelling platform. This model can be used to understand these drivers of market revenue, analyse key commercial risks and assist in strategy development.

BID3 is an 8760 hour per year dispatch model which fully reflects and optimises thermal plant characteristics.

Since 2008, BID3 has been used to assess the value of 168GW of generation capacity across Europe and the MENA region with a combined value of $190bn. It is known and trusted by developers, utilities and investors throughout the globe.

FIGURE 5 - OUR BID3 DISPATCH MODEL REFLECTS THE IRANIAN POWER SYSTEM IN DETAIL



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Staying on top of your game means keeping up with the latest thinking, trends and developments. We know that this can sometimes be tough as the pace of change continues...
At Pöyry, we encourage our global network of experts to actively contribute to the debate - generating fresh insight and challenging the status quo. The Pöyry Point of View is our practical, accessible and issues-based approach to sharing our latest thinking. We invite you to take a look – please let us know your thoughts.

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