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Product 3 report

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TABLE OF CONTENTS

Introduction

1. As part of our work for the Energy and Gas Regulation Commission ("CREG") we delivered a first report, Diagnosis of the Colombian Gas Transportation Market ("Product 1"). In Product 1, we determined the Strengths, Weaknesses and Opportunities of the Colombian gas Market. Product 1 informed the selection of an international benchmark to assess different Tariff and Capacity Allocation schemes and their suitability for the Colombian national gas transport system ("SNT").

2. Produce 2 was a second report: Review of the International Experience and Definition of the Remuneration Models for Transportation Recommended for Colombia. The report recommended changing to an Entry-Exit system for both tariffs and capacity allocation.

3. This report is one of three main deliverables for Product 3. First was a presentation at a workshop for market participants. Second is the report itself, including a presentation ("Appendix A") that serves as a high-level guide on the selected methodology, the model and the implications of an Entry-Exit methodology based on Capacity Weighted Distance ("CWD"). Third, we have also submitted the model ("Brattle Model") used to estimate the new tariffs.

4. This report has three sections. Section I explains the implementation of the CWD methodology in the Brattle Model to determine potential new Entry-Exit tariffs.[1] Section II describes the roadmap for implementing such a system, including a description of how the commercialization of gas and capacity would work, and a summary of prospective regulatory changes. Section III assesses the impacts of the potential Entry-Exit tariffs on the main consumer groups in Colombia.

[1] Appendix A further compliments the description with snapshots of the model and mathematical description of the methodology.

I. Description of the model

5. We recommend the implementation of a flexible Entry – Exit capacity model, accompanied by a new set of Entry – Exit tariffs employing a Capacity Weighted Distance approach.[2] As discussed in "Producto 2", the cost reflectivity and simplicity of this approach support our recommendation.

6. Our model is only a point of departure for assessment and refinement; the CREG must determine and approve a final tariff model. Subsequent versions of this model may contemplate different entry and/or exit points, and routes, depending on how the Colombian gas transportation evolves in the coming years. The current model allocates costs to each entry point to reflect the average distance between it and exit points, considering the total capacity on each route. The model works in the same way to allocate costs to each exit point, considering its average distance to entry points, and the capacity of each route. We have calculated the model with a 50/50 percent Entry – Exit split. That is, the total capacity booked at entry points would raise the same system revenue as the total capacity booked at exit points.

7. Section A states the main assumptions and inputs of the model. Section B describes our approach to identifying key segments and routes, the calculation of distances, the determination of the Capacity Weighted Distances and required revenues for each point and, finally, the determination of each Entry – Exit tariff.

A. Main assumptions of the model

8. The model calculates Entry-Exit tariffs for an expanded 2026 version of the current system. We assume that most of the developments and bi-directional flows contemplated in the Plan de Abastecimiento come into operation by 2026. Specifically, we consider the following developments:

    a. The 'Anillamiento' (developed by private parties) for Jobo – Medellín. Regulated tariffs would not recover that investment, so we do not contemplate it within the model's estimate of total system costs;[3]

    b. Interconnection: In Ballena between coast and interior system, as stated in the Plan de Abastecimiento;

[2] In this section, we will describe the methodology and calculations *only* of the **tariff model**.

[3] We anticipate that the assumption may prompt a minor underestimation of the tariffs.

c. Bi-directional flows: Yumbo-Mariquita; Barranquilla-Ballena; Barranca – Ballena;

d. Buenaventura Entry Point: Including pipeline between Buenaventura – Yumbo;

9. Most information used in the model comes from publicly available sources. The model's main inputs are:[4]

a. System costs.

System costs come from two main sources: current 100% fixed - 0% variable regulated rates for existing segments in the system, and investment costs estimated for new developments and bi-directional flows reported in the Plan de Abastecimiento. The system's total required revenue comes from adding the required revenue for existing segments to the required revenue for new routes[5].

The model estimates the required revenues for existing segments, multiplying the 100% fixed rates by the expected booked capacity for each segment. We apply an inflation factor to current rates, to derive projections for 2026.

We calculate the required revenues for planned routes taking the investment values[6] reported in the Plan de Abastecimiento for new developments. The calculations assume a 15.02% allowed return on capital as established by the current regulation,[7] and a 20-year regulatory useful life.

b. Technical capacity.

For existing segments and routes, we use technical capacity[8] (CMMP) information reported by the Gestor del Mercado.[9] Whenever technical capacity information is not available for a particular segment with the Gestor, we use information on CMMP reported in the tariff resolutions for the different operators published by CREG.

We assume that the technical capacity for existing routes will remain constant to 2026. We consider the technical capacity reported in the Plan de Abastecimiento for new routes and counter-flows for existing pipelines.

c. Booked capacity.

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4 For a detailed understanding of the sources employed for each input, please refer to EE tariffs spreadsheet model also part of the "Producto 3" deliverable.

5 Contemplated in the Plan de Abastecimiento.

6 We assume investments reported in the Plan de Abastecimiento are nominal investment values.

7 Resolución CREG 126 2010 with current transport tariff methodology.

8 The "Capacidad Maxima de Mediano de Plazo" (CMMP) was used as the technical capacity for the different segments.

9 Information available in the following link: | BEC - Gestor del Mercado de Gas Natural en Colombia (bmcbec.com.co)

We rely on information reported by el Gestor de Mercado and, if not available, we use the tariff resolutions published by CREG. We assume that booked capacity will remain constant as a percentage of technical capacity in 2026.

For new routes, we multiply their CMMP by the same average percentage that current booked capacity represents of the total technical capacity for existing routes.

d. Throughput volume or commodity demand.

We use information on throughput drawn directly from the Gestor del Mercado website, as well as in CREG's tariff resolution—if not available with the Gestor. For new routes, we apply the same average load factor as for all existing routes.[10]

e. Distance.

For existing routes, we rely on information on distances from CREG. For new routes, we rely on the Plan de Abastecimiento.[11]

B. Step by step calculation of Entry – Exit tariffs

Identification of pipeline segments and routes

10. A first step is to identify pipeline segments of interest for the analysis. We focus on routes likely to be used in practice, mostly taking into account bigger cities and relevant entry and exit points, as well as bundling some exit points together. Not all combinations of points forming a route are possible, and the study does not consider all existing routes.

11. We assume the following combinations of entry to exit points:[12]

  a. Ballena: supplies to all exit points
  b. Buenaventura: supplies only to some exit points located in the interior of the country
  c. Cusiana: supplies exit points located in the interior of the country
  d. Gibraltar: supplies to all exit points
  e. Mamonal: supplies to all exit points

[10] We used this average load factor to ensure we would not have impossibly high load factors for new or existing routes.

[11] Whenever information was not available, we approximated the distance by using a similar route as a reference.

[12] See slide 10 in Appendix A.

12. With the aforementioned information, we construct a matrix where a "Yes" indicates those combinations of entry and exit points identified as possible and/or relevant routes.[13] This matrix is the basis for the rest of our model.

Distances for Routes

13. For step 2, we calculate the distances for each of the routes selected in step 1.

14. We obtain the total distance per route, by aggregating the distances of each of the different segments included within a given route, as shown in the hypothetical example below.[14]

FIGURE 1. ROUTE DISTANCE EXAMPLE

Source: Elaborated by author. Not actual distances.

15. We design a matrix[15] that allocates each pipeline segment to routes. For each route, we add up all the distances of its segments.

13 See slide 10 in Appendix A.

14 Actual calculated distances can be consulted in Brattle Model.

15 See Tab 'Current tariffs for routes – MX' in Appendix A.

Capacity Weighted Distance Entry-Exit tariffs

16. Next, we determine the new Entry-Exit tariffs by using a Capacity Weighted Distance approach. As mentioned above, we apply a 50:50 split between entry and exit points.

17. The Association for the Co-operation of European Regulators ("ACER") has published guidelines for the methodology that we apply.[16] Below we summarize the steps in the ACER guidelines:[17]

    a. First, we calculate the percentage of technical entry (or exit) capacity at each point relative to the total technical entry (or exit) capacity of all points.

    b. Second, for each entry point (or exit point), we calculate the Capacity Weighted Average Distance to all exit points (or entry points). The average distance is the product of multiplying the percentages mentioned by the technical capacity.

    c. Third, we determine the weight of each entry point (or exit point) as the ratio between the product of its technical capacity with its average distance and the sums of such products for all entry points (or exit points).

    d. Fourth, using the weights of each entry point, we allocate the required revenue for each point by multiplying the total revenue to be collected from all entry points by the weight of each entry point. The same applies to all exit points.

    e. Finally, we determine tariffs by dividing the required revenue from a given point by its booked capacity.

18. The results of the methodology are the Entry – Exit capacity charges of the system, which aim to recover the system's investment costs. We propose, however, a second volumetric charge for the recovery of O&M (or "AOM") costs. We determine the volumetric charge as the sum of AOM required revenues for existing segments and new routes, divided by the system's expected throughput.

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16 Agency for the Cooperation of Energy Regulators (ACER), Tariff Methodologies: Examples, July 2013, p.9.

17 See slides 13 and 14 of Appendix A for all of the equations associated to each step.

I. Implementation roadmap and regulatory adjustments

C. Implementation

19. Below we discuss the recommended steps for a transition to an Entry-Exit system, including the benefits of establishing a Transportation System Operator ("TSO"). We also describe how the commercialization of gas and capacity would work, and we conclude by discussion prospective modifications to the current regulation.

1. Engineering Study and System Constraints

20. The first step would be to commission an engineering study of an integrated and expanded SNT. The purpose of the study would be to understand where any physical constraints would affect the maximum capacity available as firm at each entry and exit point under an Entry-Exit system.

21. We have no basis to expect that a switch to Entry-Exit would imply a significant reduction to the capacity currently available as firm. In Europe some TSOs expressed concerns that the transition to an Entry-Exit system would reduce the available capacity. The concern was that the TSO would no longer know where gas might flow in the system. Users would no longer booking gas transportation along specific point-to-point paths. Rather, each user would simply book entry capacity and/or exit capacity. The flow from an entry point to a given exit point may not even be physically possible.

22. However, these concerns turned out to be largely unfounded. Changing from a point-to-point system to an Entry-Exit system does not physically move the points, and does not move the locations of gas fields or gas sources, or consumers. The introduction of Entry-Exit can lead to some effects on flows as customers switch suppliers. But the physical flows in the gas pipeline networks have remained largely unchanged. We would therefore not expect changes in flows or reduced capacity from the introduction of an Entry-Exit system.

23. It is also important to appreciate how 'swaps' in a network address mismatches between contractual nominations and physical flows. For example, suppose that suppliers on the coastal pipeline signed a contract to supply 10 units of gas to customers in the interior, but the connection between the coastal and interior pipeline networks only had a capacity of 6. At the same time, producers in the interior sign contracts with customers on the coastal network. In this case, the network could honour all requests with an implicit swap, in which the gas from the interior producers physically supplies the interior customers. Similarly, gas

from the coastal producers would physically supply the coastal customers. The swap in this example would overcome the physical capacity constraint between the coastal and interior pipeline systems.

24. An engineering study could identify a consistent physical constraint in the system that swaps are unable to overcome. In that case, the constraint could justify dividing the system into two regional Entry-Exit systems, connected by the constrained point. For ease of exposition we refer to 'system 1' and 'system 2'. The connection point between the two systems would satisfy entry and exit functions for each system. For example, a user wishing to transport gas from system 1 to system 2 would book entry capacity in system 1, exit capacity from system 1 at the interconnection point, entry capacity to system 2 at the interconnection point, and then exit capacity in system 2.

25. Historically, Europe has plenty of examples of 'multi-zone' Entry-Exit systems. Examples include France and Germany. However, TSOs and users found that dividing Entry-Exit areas into multiple zones had a negative effect on trading liquidity, since each Entry-Exit zone had its own 'virtual' trading point or hub. Having multiple Entry-Exit zones divided up trading liquidity, so trading volumes struggled to achieve a 'critical mass'. Hence, over the last few years TSOs have made efforts to reduce the number of zones. The consolidation of zones has succeeded in promoting liquidity.

26. For example, France initially had four zones. They gradually merged, and the last two zones were the north and south. The French TSO recently invested to remove the bottleneck between the north and south parts of the pipeline system, so that the north and south zones could combine into a single French Entry-Exit system. Similarly, Germany started with over 20 zones, which eventually merged to form three, then two. Since October 2021, the zones have merged to form a single Entry-Exit zone, and hence a single hub, for all of Germany.

27. Accordingly, and based on the European experience, we recommend that a Colombian Entry-Exit system should rely on swaps as far as possible to address transmission constraints. If the engineering study identifies insurmountable physical constraints, then it would be advisable to consider investing to relieve these constraints, to create a single Colombian Entry-Exit system. A single national system will maximise the chance of developing a liquid Colombian trading hub.

2. Refinements to Entry-Exit Tariffs

28. Our existing model provides a point of departure for further study. Here we identify just one of several possible issues for consideration. The model suggests that the new system could raise the tariffs for a few specific exit points, which are currently close to entry points. The methodology produces such a result, because it considers each exit point's proximity to all

entry points in a unified Colombian system, even if the particular exit point would not likely use the system to bring gas from the most distant entry points. The interconnection of the independent pipeline systems will actually open up the possibility of importing gas from more distant points, which prompts an increase in the distance measured under the capacity-weighted distance methodology. The increase in the imputed distance raises the tariff. From one perspective, such a tariff increase is reasonable because the interconnection of the two systems provides access to more entry points in order to induce greater competition, which will reduce gas prices. No user at a particular exit point will want to see an increase in its tariff, but a reasonable user should welcome the prospect that competition reduces the price it would have to pay for the molecule itself.

29. Nevertheless, in Product 2 we noted that a postage stamp system could invite inefficient system bypass, from users who are close to sources of natural gas. They may have financial incentives to disconnect from the existing system to build their own infrastructure. The same issue arose in Great Britain, with its entry-exit tariffs based on long-run marginal costs. The regulator addressed the issue by implementing a special tariff known as the ‘short-haul commodity tariff’ for large users within a certain distance of major gas sources. A similar accommodation could be possible in Colombia.

30. An alternative way to address the issue would be to use another factor than capacity for calculating weighted average distances. For an exit point close to a major gas source, one could calculate the weighted average distance by considering that, for the vast majority of the time, the supplies would come from the closest major source, and that distant sources would likely only serve as back-up. The anticipated frequency of flows from different sources could set the weights for setting the exit tariff. However, this alternative approach has a disadvantage: it is difficult to estimate the frequency of future recourse to back-up. Once Colombia has the ability to import LNG from both the Carribean and the Pacific coasts, experience suggests that there may be times when it is significantly cheaper to import LNG at one coast compared to the other, and the identity of the cheaper coast can also change as Asian and European LNG markets change. If the frequency of shifts in sources is difficult to predict, then it may be best simply to weight the capacities, and to address by-pass concerns separately. The issue is sufficiently complex as to warrant further study.

3. A Network Code

31. Another issue relates to the creation of a system wide ‘network code’. Experience indicates that different pipeline transportation owners tend to have different contracts with users. The balancing penalties, balancing period and nomination procedures may differ between the TGI and Promigas pipeline networks.

32. For a Colombia-wide EE system, we recommend introducing a single set of rules, terms and conditions for using any entry or exit point in the system. In other words, a 'network code'. The terms and conditions of the code would apply to all users. Inevitably, this process would involve consideration of how to adapt existing transportation contracts. Hence, we recommend prioritizing the prompt initiation of work on the development of a network code, likely based as far as possible on the existing transport contracts and rules.

33. A completed network code would form part of the contract for a user buying entry or exit capacity. With a network code, the contract for entry or exit capacity could be very short and simple, specifying simply the entry point where the user is buying capacity, the capacity price, and the duration of the agreement. The contract could then refer to the much longer network code that the user agrees to abide by as a part of the contract to buy entry or exit capacity.

4. Role of the TSO

34. The creation of an Entry-Exit system introduces a number of new operational issues that other countries address through the creation of a system-wide TSO. We recommend considering a TSO for Colombia.

35. An Entry-Exit system that covers two pipeline systems would create the need for financial transfers between pipeline owners. The money that a given pipeline collects from entry and exit charges could be more or less than the regulated revenues. Hence, one of the pipeline owners will likely collect more than its regulated revenues, and one will collect less. The one that collects more should transfer payments to the other pipeline that collects less, so that both end up earning nor more or less than their regulated revenues.

36. It would be possible to arrange these transfers bilaterally between the current pipeline operators. However, this could give rise to issues. For example, one pipeline could face credit risk associated with the potential financial failure of the other pipeline. The pipelines that collected excess revenues could have an advantage if they retain the excess for a time before the transfer; it could be an implicit source of free working capital.

37. A TSO could overcome these issues. The TSO could collect all of the tariff revenues, and then allocate the collected revenues to the pipelines in accordance with their required revenues. If the State backed the TSO there would be little credit risk, and no pipeline would have any advantage or disadvantage with respect to working capital.

38. A second issue involves swaps, which we discussed earlier. It would be possible for separate pipelines to discuss between them operationally how to manage swaps. But the process

would be likely be easier for a TSO with an overview of capacity bookings and nominations for the entire system.

39. A third issue relates to balancing. A user is "balanced" if its injections into an entry point match its withdrawals at the exit point. However, if the entry point and exit points belong to different pipelines, then the two pipelines would need to communicate to one another to determine if the user is in balance. Bilateral communication is possible, but it could be simpler to have a single organisation manage the balancing process across the whole system. Having a single TSO would also help include trades into the balancing calculation. A user's comprehensive balance position can include a) injections into the system, plus b) gas purchases within the system, minus c) gas sales within the system, and minus d) withdrawals at the exit point. If the TSO also had an over view of the trades performed, it would be in the best position to assess each user's state of balance.

40. The most comprehensive role of a TSO involves balancing actions. If a TSO has a full picture of the balance positions of users, it can seek additional injections or withdrawals as necessary to retain system pressure. The alternative to the TSO would be to require the independent pipeline owners to sign Operational Balancing Agreements (OBAs) between them, to co-ordinate how each pipeline would react to changes in system pressure. The OBAs typically include rules for compensation if one system supplies gas to avoid unacceptably low pressure on the other. Experience indicates that OBAs can work; they apply at the borders between European TSOs. However, within a country, most governments have found it efficient to have a single TSO measure the balance positions of users within the system, and to manage the additional purchases or sales of gas necessary to maintain pressure. We recommend further study to determine the precise scope of functions for a future TSO in Colombia.

41. The CREG has essentially two choices for who could perform the role of the TSO. First, it could establish a completely new organisation to perform the role. Second, it could expand the current role of the Gestor del Mercado to include the TSO responsibilities.

42. Either way, the CREG would need to establish reasonable costs for the TSOs activities. It could launch a tender process, after defining the role of the TSO. If the Gestor del Mercado naturally has lower costs to perform the role, then it would win the tender.

5. Transition Strategy

43. As we highlight above, the cost of transporting gas from one point to another would change under an Entry-Exit system, relative to the current point-to-point system. For some routes, the change could be significant. One possibility would be for the CREG to manage the change by making a gradual transition to the new Entry-Exit tariffs.

44. On the one hand, a gradual transition – say over 4-5 years, could help users adjust to the new tariffs. On the other hand, we note that most of existing tariffs should decrease under an Entry-Exit scheme, since in 2026 the system will be able to collect money from new routes that do not yet exist. Clearly, users should not have an issue adapting to a lower cost of transport capacity.

45. On balance, we recommend that, at a later stage, CREG should carry out a market consultation to determine what system users would prefer, paying particular attention to users that are likely to experience an increase in costs.

6. Effect on Primary and Secondary Markets of capacity

46. A change to an Entry-Exit system would have very little effect on the functioning of the Primary and Secondary capacity markets, or Use It or Lose It (UIOLI) regulations. At present, users buy primary capacity for a given route, or trade capacity on that route. A key difference with an Entry-Exit system is that each user would have an option to book entry capacity without also booking exit capacity simultaneously. Similarly, users could sell capacity on the secondary market at a given entry point, without also selling the exit capacity or vice versa. More options would therefore exist in the primary market, and in the secondary market. In practice, as discussed below, certain large consumers find it attractive to buy and manage their own transportation capacity.

47. Similarly, the UIOLI rules would apply in the same way, but to entry (or exit) capacity rather than point-to-point capacity. The same rules and auction procedures could apply.

D. Commercialization of gas and capacity

48. As indicated above, an entry/exit system need not imply any significant change to the process of buying and selling gas or transportation capacity. However, it introduces new options. Large users may begin to buy and manage their own transportation capacity. That has proven the case in Ireland, where the largest users are power stations, and most have signed on to the network code as direct users of the system.

49. Prior to the introduction of entry/exit systems, the gas sales contracts with large users tended to bundle the provision of transportation service with the supply of the molecule. The gas sales contracts would have penalties for taking excessive or insufficient amounts of gas, relative to amounts nominated to the gas seller. Different gas sellers might offer contracts with different rules and different penalties.

50. Under an entry/exit system, some large users buy their own transportation capacity, make nominations to the TSO, and become directly responsible to the TSO for any imbalances

between the amounts nominated and the volumes of gas actually consumed. The imbalance rules in the network code therefore substitute for contractual provisions in the gas purchase contracts that the large users previously had with gas suppliers. The imbalance rules simplify competition for the large user, as the rules stay the same despite the potential change in the identity of the gas seller or the route along which the gas travels. The competition among alternative gas sellers therefore focuses more on the price of the gas molecule.

51. In an entry/exit system, gas producers and importers often purchase their own entry capacity, and absorb the costs of that capacity as part of the costs of doing business, and then sell gas inside the system to large users who manage their own exit capacity. They can also sell gas to commercializers, who buy and manage the exit capacity of smaller customers, and who purchase in bulk.

52. The switch to an entry/exit regime typically does not imply any significant change for the small user, who continues to sign contracts with commercializers that bundle together the provision of the transportation service with the purchase of the molecule.

53. In practice, the large users acquire two options under an entry/exit system. One option is to buy only exit capacity, often on a long-term basis coinciding with the anticipated lifetime of the plant. If the user only buys and manages exit capacity, it will purchase gas that is “inside” the pipeline network. Product 2 explained that entry/exit systems in fact encourage the anonymous trading of gas within a network. Large users sometimes conduct competitive tenders for their gas supplies; as the market gets more liquid, the large users become comfortable buying gas pursuant to standardised contracts on a short-term basis. Many power stations in Europe now buy gas directly on hubs.

54. A second option is for the larger user to buy both exit capacity and entry capacity at a specific point. In Ireland, the large power stations buy their own exit capacity, and several also buy entry capacity from the large undersea pipelines connecting Ireland with Great Britain. That allows the power stations to have access to the liquid gas hub known as the “National Balancing Point” or NBP in Great Britain. In Colombia, the equivalent phenomenon would be for a commercializer to buy a combination of exit capacity and import capacity at an LNG terminal, and to arrange directly for LNG imports.

55. As indicated above, an entry/exit system does not imply any change to UIOLI rules or congestion management. Similarly, it does not affect the instruments that the legal regime may utilize for expansion. European entry/exit systems have a menu of options for expanding the system. One involves a central planning process directed by the government, which identifies projects of broad interest, and typically constructs them pursuant to public tenders that lead to contracts with private construction companies. The network would then treat the costs of the construction contracts as investments to recover from regulated tariffs.

56. A second option involves negotiations between the government and private parties who propose specific projects. For example, a private party may propose to build a new regasification terminal, and persuade the government of the value of the project, perhaps by conducting an "open season" for the terminal. Satisfied by the need for the terminal, the government could agree to a long-term contract to pay for the new infrastructure, much like a long-term concession contract for a new toll road. The new terminal would join the pipeline network, and the costs of the concession contract would be one input along with others to determine the total revenues needed to recover the costs of the entire natural gas transportation network. The construction of the terminal would imply the establishment of a new entry point, with entry charges applying to all LNG that the terminal regassifies and injects into the pipeline system.

57. However, under the second option above, the entry charges applicable to the terminal itself and its entry point need not specifically recover the costs that the government incurs under the long-term concession contract. The Spanish system has permitted the private construction of an LNG terminal in Bilbao, whose costs contribute to total system costs. The specific costs of the Bilbao terminal do not affect the specific regulated tariffs for its use. Rather, for many years the regulated tariffs at all Spanish terminals have been identical under the Spanish "postage stamp" system despite their different costs.

58. A third option is to allow the construction of infrastructure that remains outside the regulated system, but that pays an entry or exit tariff for connecting to the system. In several European countries, private parties have proposed undersea pipelines that extend between countries, or have proposed new LNG regasification terminals, or new storage infrastructure, which secures exemptions from regulated tariffs. In such cases, the new infrastructure would imply the creation of a new entry or exit point, and sometimes both. For example, a new storage facility can be an exit point because it takes gas out of the pipeline network, and can also serve as an entry point because it reinjects gas into the network. If the new infrastructure itself remains outside the regulated system, then the associated entry or exit tariffs will only reflect the costs of transporting gas to and from the new point at which the infrastructure connects to the system. For example, some LNG terminals in Great Britain have secured exemptions from the regulated system. They must still pay entry tariffs for the gas injected into the pipeline network, but there are no regulated tariffs for their services of unloading LNG vessels, storing the LNG tanks, or regassifying the LNG.

E. Regulatory changes

59. Table 2 below summarises certain regulatory modifications necessary to implement the Entry-Exit tariff and capacity model proposed.

TABLE 1. PROPOSED MODIFICATIONS FOR THE ENTRY-EXIT TARIFF AND CAPACITY MODEL AND APPLICABLE REGULATORY CHANGES

Proposed modification	Affected regulation	Applicable regulatory changes
Tariff model		
Determine regulated tariffs for entry/exit points instead of routes	**CREG 126 2010**	Modify regulation to establish rates that will apply to entry and exit points. Specific entry and exit points may be included in the regulation and updated periodically.
Determine and describe the applicable CWD methodology.		Modify regulation and describe CWD approach. Determine and define the main inputs for the calculation. It is important to note it is not necessary to modify the way these inputs are determined to implement the Entry-Exit tariffs.[18]
Modification of tariff structure		Modify regulation to implement a simplified tariff structure with two charges: one capacity charge for the recovery of fix costs[19] and a second volumetric charge for the recovery of variable costs.[20]
Capacity model		
Creation of a system-wide TSO	**RUT**	While not essential, this might help implement an Entry-Exit capacity model. The RUT could be modified to implement a single TSO that coordinates financial transfers, nominations, bookings and balancing issues.
Establish capacity bookings for entry/exit points instead of routes	**RUT**	Modify the RUT to specify capacity bookings will take place for entry/exit points

[18] Required revenue, capacity (CMMP) and investment valuations and calculations are independent from the EE tariff approach.

[19] Investment costs.

[20] AOM costs.

Determine new procedure for the selection of the TSO	**CREG 055 2019**	Considering the TSO will not only concentrate commercial information on the market, but will take care of transfers, balancing among other tasks, a new procedure for the selection of the TSO must be designed.
Implement capacity commercialization for entry/points instead of routes	**CREG 185 2020**	Modify regulation to determine market participants will trade, auction or negotiate capacity acquired for a given entry/exit point instead of for routes.

Impacts

60. We have analysed the potential impacts of the modifications of our recommendations and the expected changes to the SNT on the four main consumer groups of gas on Colombia; Residential, Industrial, Thermoelectric, and Refineries. The modifications entail both the migration to the recommended Entry-Exit tariff (based on CWD) and capacity allocation scheme, as well as the opportune implementation of the expected changes to the system.[21] Appendix A[22] contains the results detailing the change in tariffs for existing routes, once applied the CWD methodology.

61. From the graphs in Appendix A, we observe that almost all existing tariffs analyzed in the model observe a reduction. The reduction is mainly the result of the fact that the model assumes that in 2026 the SNT would have migrated to an interconnected system with additional routes, hence required revenue will also be recovered these.

62. Routes that would see an increase in tariffs are mainly those where entry and exit points are very close by. This is the inherent result of the distance weighting in the CWD methodology. For example, routes like Mamonal – Cartagena o Ballena – La Mami or those from La

[21] As mentioned in Appendix A, the model assumes the construction of the Jobo-Medellín pipeline and th proper implementation of the Plan de Abastecimiento, including; a) the interconnection of the system; b) the construction and connection of the new Buenaventura regasification plant; c) the implemented bi-directionality and increase in capacity in some existing routes.

[22] See Slides 24 to 29 of Appendix A.

Creciente would experience increases.[23] Mechanisms in order to deal with these issues and avoid any incentives for inefficient bypass are discussed previously.[24]

63. Table 2 presents the summary of our preliminary assessment on the impact of the new estimated tariffs by consumer group by geographical area (coast vs interior). The results tables in Appendix A compare tariffs for routes in the system. In order to estimate the total tariff for a given route in the Entry Exit scheme you would just add the Entry tariff plus the Exit tariff.

[23] See slides 24, 26 and 29 of Appendix A.

[24] See ¶29 above.

TABLE 2. IMPACT ON DEMAND AND PRICES OF NATURAL GAS BY AREA IN COLOMBIA AND TYPE OF CONSUMER

	Area	
Main Consumers	**Coast**	**Interior**
Residential	- Market data shows that residential demand is approx. 20% in the coast and 80% in the interior.[25] - Residential transport tariffs for some routes in some cities such as Cartagena, Santa Marta and Barranquilla would see an increase.	- Tariffs for almost all routes from Ballena, Gibraltar and Cusiana to the interior would all reduce.[26] - Imported gas from Mamonal can now reach the interior. - The commissioning of the Buenaventura regasification plant would create new options for gas for cities south of Mariquita.
Industrial	- Some cities such as Barranquilla, Cartagena and Santa Marta observe an increase in tariffs. Market data shows industrial demand is only approx. 20% in the coast.[27] - The increase in transport tariffs could be offset by more competition in gas supply prices due to Entry-Exit scheme	- Interior market would be benefited as lower tariffs from the coast are observed. - New entry point from Buenaventura is also a factor in the decrease of tariffs and would also bring competitive gas prices to industrial cities like Cali - New pipeline from Jobo to Medellin would result in lower tariffs for industry here.
Thermoelectric	- Prices of gas could be expected to be slightly higher in some routes to plants close to in plants in very close to gas sources (e.g TEBSA) -	- Current installed capacity higher in interior approx. 56% but relatively lower natural gas demand approx. 30% - Demand could increase in interior as cheaper gas would be available due to lower transport tariffs to the interior of the country.
Refinery	- Refineries such as the one in Cartagena could experience similar impacts as those discussed for thermoelectric plants.	- We observe that overall gas transport tariffs to the Barrancabermeja refinery would be lower from all entry points.

Source: Own elaboration.

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25 'Gestor del Mercado', Portal BI Gas.

26 The exceptions being Cusiana – Cogua; Cusiana – Apiay; and Cusiana – Usme and Cusiana – Sabana.

27 *Ibid*.

64. Finally, it is important to take into account that the shift to an Entry-Exit scheme could have effects in the current hoarding of capacity. The additional routes and entry points plus more successful results in the use it or lose it rules could result in lower capacity bookings. This could essentially have an impact in tariffs as lower capacity bookings would translate to higher tariffs.

65. As mentioned above[28] the migration to an Entry-Exit system would create the need for financial transfers between transporters. It is important to note that this would not have an effect in the total required remuneration of each transporter.

[28] See ¶¶35 and 36 above.