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REPLY COMMENTS OF DUKE ENERGY INDIANA REGARDING THE COMPANY'S 2013 INTEGRATED RESOURCE PLAN

I. Introduction

On November 1, 2013, Duke Energy Indiana submitted its 2013 Integrated Resource Plan ("IRP"). Although the IURC's new IRP rules are not yet final, Duke Energy Indiana has attempted to follow the process and requirements embodied in the draft rules. The Company's process included a five-meeting stakeholder engagement process in which the Company and participants discussed the methodologies and assumptions utilized in the IRP modeling and the results of that modeling prior to finalizing the IRP. Duke Energy Indiana seriously considered and responded to stakeholder comments throughout the process, as documented in the IRP. In accordance with the proposed IRP rules, additional comments have been received from the IURC's Director of Electricity, Dr. Brad Borum, and some stakeholders. Also in accordance with the proposed rules, Duke Energy Indiana is providing responses to these comments in this document.[1]

II. Duke Energy Indiana's responsive comments to Dr. Brad Borum's February 28, 2014 Draft Report

Dr. Borum's draft report covers a number of subjects that are addressed in detail below. In some cases, it appears that Dr. Borum was anticipating a much more in-depth discussion of some of the issues within the IRP report than what Duke Energy Indiana had contemplated was required or desired by the proposed IRP rules. Instead, Duke Energy Indiana sought to make the IRP more readable and less voluminous. The Company can make modifications to the depth of discussion contained in its 2015 IRP if that is desired. Some of the detailed issues addressed in the draft report may be more efficiently addressed by informal discussion in future IRP processes. Duke Energy Indiana has responded to all the issues herein. To the extent that Dr. Borum or other IURC Staff have additional questions or they feel that the responses below are not sufficient, Duke Energy Indiana is willing to have further discussions to ensure that all questions are answered.

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[1] Duke Energy Indiana is providing comments to the Commission's Director of Electricity Division Draft Report as well as brief responses to the comments made by stakeholders.

Load Forecasting

Commission Comment – p. 11/12:

The forecasting methodology appears to be reasonable but the 2013 IRP contains fewer details than their 2011 IRP and there are some changes to data sources and methodologies with no accompanying explanation for the change.

This raises a number of questions:
1. Is the equation specification essentially the same between the 2011 IRP and the 2013 IRP?
2. If yes, how is the Efficient Appliance Stock estimated?
3. The 2011 IRP refers to the real marginal price of electricity while the 2013 IRP refers to real electricity prices. Is there a difference in how the real electricity price is calculated between the 2011 and 2013 IRP load forecasts?

Duke Energy Indiana Response:

Duke Energy Indiana shortened the description of the load forecasting methodology to focus on key aspects of the process and highlight the most important assumptions. The goal was not to develop a forecasting manual or to present a detailed description of the econometric models.

Although the description of the forecasting process was simplified, the underlying analysis was not. In fact, the analysis was expanded to include scenarios, and some of the econometric equations actually increased in complexity. In addition, the internal review of inputs, models and results was expanded to include feedback from other forecasters in the company, internal stakeholders and senior management.

The equations are essentially the same as in the 2011 IRP with the exception of a few instances where the econometric specification was enhanced.

The efficiency for the residential appliance stock was derived from EIA data and calibrated using internal end-use saturation survey data, just as in the 2011 IRP.

The calculation of real electricity prices for each of the customer segments was performed in the same way as in the 2011 IRP with some enhancements to the inputs used. For example, the projected retail revenues were studied in more detail to understand the contribution from each type of charge. Similarly, the long-term projection of commodity prices was assessed in more detail to determine the appropriate approach for escalating the variable and fixed components of retail rates.

Commission Comment – p. 12:

DEI moved from the use of aggregating county level data to state level data without explaining why. The reader is left to assume that the state level data was easier to develop and gave better or similar results compared to the use of county level data in the forecasting process. The affected data includes employment, income, and population.

Duke Energy Indiana Response:

Duke Energy Indiana decided to use state level data for 3 reasons:

1) It is much cheaper than county level data and provides the same explanatory power for forecasting purposes. This is not a subjective observation but the result of statistical tests.
2) The forecast by county is actually done by allocating the forecast for the state to each county based on historical contribution ratios; consequently, the county level forecast is not only dependent on the accuracy of state level projections but also on the accuracy of historical ratios.
3) The state level economic projections used by Duke Energy Indiana can be compared against other forecasts for the State of Indiana, but the same cannot be said for county forecasts because there are no reliable sources to produce county level projections that cover a 20 year horizon by month.

Scenario/Risk Analysis

Commission Comment – p. 14:

It should be noted that while this approach is useful for comparing the three specific portfolios, it can give a false sense that a particular portfolio is "best" across a wide range of scenarios. There could be a fourth portfolio that is not optimal under any of the three defined scenarios but is better than any of the others across a wide range of the intermediate combinations of scenarios.

Duke Energy Indiana Response:

It is theoretically possibly that a portfolio exists that is best across a range of scenarios but is not the least cost portfolio in any scenario. Determining if such a portfolio exists and specifying its resources is beyond the capability of the optimization model. Given that all three portfolios, each of which was optimized for its corresponding scenario, are very similar over the first 10 years, it is most likely that a "fourth portfolio" would also be similar over the same period. Duke Energy Indiana is evaluating the possibility of including more portfolios in its 2015 stakeholder process and IRP.

Commission Comment – p. 14:

Individual sensitivities were run across each scenario for CO2 costs, load growth, renewable standards, capital costs, gas prices, and coal prices. These sensitivities generally consisted of an alternate low and high value. For the case of the load growth and renewable standard sensitivities, it would be necessary to change the resource mix in the portfolio (either because the amount or type of resource would change). Duke does not explain the methodology for making those adjustments. The Planning and Risk model does not do this, so another method would be needed, such as an ad hoc method or running it through System Optimizer beforehand.

Duke Energy Indiana Response:

For the sensitivities that would cause a change in the net load to the utility and, as a result, the resource plan, System Optimizer was used to develop the modified portfolio and to determine the costs of those portfolios in each of the three scenarios.

Commission Comment – p. 14:

The analysis of unit retirement decisions is not as clear as it could be and leaves a number of unanswered questions:

1. What criteria were used to determine the "most at-risk" units?

2. What model was used to perform the retirement analysis? The beginning of this chapter states the models used in the resource selection chapter are the System Optimizer model and the Planning and Risk production cost model.

3. Were the retirement decisions locked-in or hardwired for each scenario in the optimization model, such that a different scenario means a different set of retirement decisions was hardwired?
4. Assuming the optimization model was not used in the retirement analysis, is there a possibility when you separate the retirement decision from the new resource decision that the hardwired retirement decision will dictate the new resource selection? For example, one can envision a situation where the retirement screen says to keep a unit online because the cost of retrofit is less than the expected benefit, but there could be a better option that gets shut out in the optimizer model because the retrofit costs are now sunk.

Duke Energy Indiana Response:

At risk units can be thought of as those units whose capacity value and net operating benefit might not cover their respective fixed costs and capital improvements. The Company evaluated Gallagher 2 & 4, Wabash River 6 gas conversion, Gibson 1-4 and Cayuga and Gibson 5 in all three scenarios. The alternative plan that included a unit retiring leveraged other System Optimizer results for the timing of CT and CC additions. For Gibson 5, not only were a number of control options considered, different retirement dates and replacement options were evaluated.

The specific retirement question was posed in years when there was the possibility of significant capital investment. The modeling was done using the Planning and Risk production cost model in addition to a spreadsheet that would calculate the corresponding capital costs. This level of analysis also allowed additional insights into the retirement decisions that would not have been available if the Optimization Model alone had been used. Once these case-by-case retirement decisions were analyzed, the results were "hardwired" into the optimization model. These retirement analyses serve as sign posts of how these units might fare given the futures described in the scenarios. As more is learned about how the future is unfolding, updated retirement analyses will be conducted prior to making final retirement decisions.

Commission Comment – pp. 14-15:

However, DEI's analysis was limited to the development of three resource portfolios whose performance was modeled under each scenario and a number of sensitivities. As is noted above, for a couple of the sensitivities it is not known if necessary changes were made to the resource portfolio and, if so, how these changes were made. Also, the use of different probabilities for each *scenario was informative by providing insight into the relative costs of each portfolio in an unpredictable world. Nevertheless, as noted above, the usefulness is limited since there could be a fourth resource portfolio that is not optimal under any given scenario but performs best over a wide range of circumstances.*

Staff thinks DEI's uncertainty analysis would have benefited from the development of at least 5 very different internally consistent scenarios. More diverse scenarios can be useful to better understand how different futures impact decisions and focuses attention on ways to maintain flexibility. However, there is a limit to how many scenarios can be used effectively; beyond a certain point there will be diminishing returns and the ability to derive useful information is reduced. How many scenarios is enough depends on how well the scenarios are designed and whether they reflect a sufficient range of possible futures.

Duke Energy Indiana Response:

The number of scenarios selected was based on a number of factors. Early in the stakeholder process, the Company discussed six different scenarios at a high level. As the six scenarios were compared, it became evident that a number of them overlapped with one another. Given the similarities among the six scenarios and the diminishing returns of incremental scenarios, the three scenarios were ultimately selected to cover a reasonable range of possible futures. In addition, having internally consistent assumptions within a scenario is very important, and the overlap in six scenarios vs. three scenarios was not determined to be worth the added cost to develop the additional three scenarios.

Commission Comment – p. 15:

There is little mention of the value of flexibility in the resource plan. In reality, one would expect the utility to change course with their resource plan if they discovered that the world was not turning out like they originally thought it would. For instance, they would likely revisit their retirement options for coal 15 years from now under the Traditional Portfolio if the world is looking more like the Environmental Focus scenario. Thus, there is value in having a resource plan that allows you to change course without substantial sunk costs. Duke does mention the importance of the short-term actions and that all three portfolios are quite similar in the short term.

Duke Energy Indiana Response:

Duke Energy Indiana believes that flexibility was a hallmark of the 2013 IRP analysis in that the three portfolios were similar over the next 10 years, as discussed on page 137 of the IRP. As more is learned about the environmental landscape over the next several years, Duke Energy Indiana believes that these similarities show that the Company is positioned to respond to new regulations accordingly.

Energy Efficiency Resources

Commission Comment – p. 15-16:

The discussion of energy efficiency is limited and no foundation was laid for why DEI chose to assume the three different levels of EE impacts that were hardwired in the optimization process. The information that is presented focuses on the history of the programs and a reasonably detailed description of the current EE programs being implemented in the 2013-2014 time period. Cost effectiveness was not addressed except to present cost effectiveness test results for Core programs from Cause No. 43955. Also, there is no discussion of how the programs might evolve over time as new federal lighting standards go into effect and change the marketplace.

Duke Energy Indiana Response:

The three different levels of EE were developed to be consistent with the themes of the respective scenarios developed during the IRP stakeholder process. The EE assumption in the Reference scenario was based on compliance with the EE levels mandated by the Generic Order and the other scenarios were derivatives of those levels as explained in the narrative describing the EE forecasts and included here for reference. From Page 52 of the IRP document:

> The Company also prepared an alternate energy efficiency scenario that provides projected KWh and peak KW impacts if full compliance with the Phase II order is achieved by the end of the planning horizon (Low Regulation Case, Table 4-B Low Case below) and a third scenario that assumes full compliance with the Phase II order along with continued significant additional reductions beyond the Phase II order for the period 2020-32 (Environmental Focus Case, Table 4-C High Case below).

The cost effectiveness was provided for the "Core Plus" (not the Core) programs because those programs are directly administered by the Company. The DSM Coordinating Committee is responsible for the oversight of the cost effectiveness of the Core programs.

Long term assumptions for EE are challenging given how programs mature differently, new technologies are developed and the potential for regulatory changes. Duke Energy Indiana's load forecast incorporated variables that capture historical and projected trends in residential end-use efficiency and saturation including projected mandates for household appliances, HVAC, lighting and electronics. For the 2015 IRP, the Company will make use of its recent EE Market Potential Study in modeling EE along with information provided by independent M&V evaluators.

Commission Comment – p. 16:

DEI's discussion also notes the load forecast incorporates the impacts of historical energy efficiency in the baseline forecast; nothing more is said (p. 54). Additional discussion of this point that answers the following questions would be helpful:
1. How does the load forecast incorporate the impacts of energy efficiency?
2. Are these impacts captured by the use of a statistically adjusted end-use model? Are the EE impacts captured some other way?
3. Can the load forecast adequately capture the impacts of the very recent large ramp-up in energy efficiency programs, especially given the Core programs did not begin full program delivery until January 2012?

Duke Energy Indiana Response:

Duke Energy Indiana captures energy efficiency in two ways:

1) The econometric regression models rely on historical metered MWH sales and those include the impact of past energy efficiency programs. Consequently, the estimated relationships between energy sales and predictor variables such as economic activity, population etc., were impacted by historical trends in energy efficiency. The resulting sales forecast is lower relative to what it would have been if energy efficiency impacts were not part of the historical sales data.
2) The projected incremental energy efficiency impacts associated with complying with the Commission's Generic Order are subtracted from the projected sales forecast. Again, the sales forecast is impacted negatively by assuming full compliance with the commission's EE mandate.

Although Duke Energy Indiana did not use statistically adjusted end-use models, it did incorporate variables that capture historical and projected trends in residential end-use efficiency and saturation including projected mandates for household appliances, HVAC, lighting and electronics. This was done in addition to including the impacts of the Commission's Generic Order.

The load forecasting equations capture the ramp-up in energy efficiency programs because such impacts are part of the metered sales data used in the econometric analysis. Furthermore, the sales forecast captures the expected continued "ramp-up" in projected incremental energy efficiency, over and above what was captured by historical data. As discussed earlier, this is accomplished because the incremental impacts of EE programs are subtracted from the base sales forecast.

Renewables and Distributed Generation

Commission Comment – p. 16:

The discussion of distributed generation in the IRP is minimal and DG is not explicitly modeled in the resource portfolio development exercise except to satisfy a minimum level of renewable generation for each scenario. Customer self-generation is discussed in two short paragraphs on page 31 in the load forecast chapter.

DEI states a customer's decision to self-generate or cogenerate is based on economics, and that such projects are generally uneconomic for most customers. As a result, DEI says it does not attempt to forecast specific megawatt levels of this activity. It is argued that cogeneration facilities that are built affect customer energy and demand and are captured in the load forecast. Again, DEI says that portions of the projections for renewables and EE in the IRP can be viewed as placeholders for these types of projects.

There are a number of issues with DEI's treatment of renewable energy and DG in the IRP:
1. DEI seems to imply that the effect of customer-owned generation is reflected in the load forecast. But it does not indicate how this is modeled, especially when technology is changing rapidly and the costs of renewable energy and DG are falling steadily.
2. DEI does not discuss how technological change is causing the cost of DG to fall significantly and how customer attitudes are changing toward the ownership and use of DG facilities. What might the implications be for the utility and how might its resource portfolio change should these circumstances become more pronounced? A thorough discussion and analysis of this topic would have been helpful.

3. To the extent the effects of customer-owned generation is not reflected in the load forecast, DEI says the projections for EE and renewable energy can be viewed as placeholders for DG resources. Again, it is not obvious that this is the case given the rapid changes in technology and falling cost for DG.

Duke Energy Indiana Response:

Although DG was not specifically modeled as a resource, the renewable resources modeled in the IRP are placeholders for a variety of types and sizes of renewables. For example, in a given year that a portfolio has a solar addition, the solar generation can be utility scale or residential solar, or some combination thereof. The costs utilized for renewables were the lower costs attributable to larger scale projects, so as to provide the greatest opportunity for inclusion in the portfolios. Additionally, minimum levels of renewable energy have been included by assuming the implementation of a state or federally mandate RPS. Renewable generation is also available to compete against other resources as part of the process of determining the components of the respective portfolios.

Duke Energy Indiana's load forecast captures the projected impacts of customer sited solar in the residential and commercial sectors. In order to develop the outlook for customer sited solar, general assumptions were made with regard to technology costs, and tax policy. The final MWH sales and MW peak forecasts are slightly lower due to the inclusion solar distributed generation.

For the Base forecast, the load forecasting process does not factor technology improvements in excess of what it embedded in the historical data and in the future values of predictor variables such as income per capita, employment and manufacturing GDP. It is not possible to forecast incremental improvements in technological innovation. Finally, it can be argued that the likelihood of sales increasing or decreasing due to overall improvements in technology is similar.

III. Duke Energy Indiana's responsive comments to stakeholder comments

Stakeholder comments were received from the Hoosier Environmental Council, Inc. ("HEC"), Wind On the Wires ("WOW"), Clean Line Energy Partners LLC ("Clean Line"), and Synapse Energy Economics, Inc. and Schlissel Technical Consulting on behalf of Mullett & Associates, Citizens Action Coalition of Indiana, Earthjustice, and Sierra Club (together "Citizen Groups"). Neither WOW nor Clean Line participated in

Duke Energy Indiana's stakeholder process. The comments received fall into the broad categories of Clarifications, Input Assumptions, Resource Options, and Modeling and will be addressed in that manner.

CLARIFICATIONS

Optimization process (WOW)

Duke Energy Indiana Response:

Costs are evaluated and minimized in the optimization models for all hours of the year, not just the peak hour, subject to meeting the peak demand. Typical output curves for wind resources are utilized, so the models take into account both benefits and costs of these resources.

Capacity Factor of Solar resources (WOW)

Duke Energy Indiana Response:

Capacity factor is not the same thing as contribution to peak. The equation for capacity factor is:

Capacity factor = MWh generated / (8760 * MW capacity of unit)

For the IRP, the capacity factor for solar was assumed to be 18%, while the capacity factor for wind was assumed to be 32.5%. Contribution to peak refers to the number of MW generated at the time of the system peak, and varies depending on technology for intermittent resources. For the IRP, the contribution to peak for solar was assumed to be 42%, while the contribution to peak for wind was assumed to be 8.9%.

Economics of existing units (Citizen Groups)

Duke Energy Indiana Response:

The comparison of fixed costs vs. energy revenues shown in the Citizen Groups' comments seem to ignore the capacity value of these units. Retirement analyses need to include the cost of replacement capacity, due to a requirement to meet a minimum reserve margin. A particular unit could have operating expenses that exceed operating revenues which might incorrectly be interpreted as the unit having negative value. The value of the existing capacity or replacement capacity needs to be, and was, considered as part of Duke Energy Indiana's IRP analysis.

IRP vs. Decision Making and Execution (multiple stakeholders)

Duke Energy Indiana Response:

The IRP is a planning document that does not include specific decisions, but rather informs and provides visibility to possible future decisions. Once a decision point is reached, such as determining the most cost effective resource to add or whether a unit should be retired or retrofitted, a separate analysis is conducted to make that specific decision, including quantitative and qualitative factors.

INPUT ASSUMPTIONS

CO_2 Prices (Citizen Groups)

Duke Energy Indiana Response:

Duke Energy Indiana included three separate CO_2 forecasts in the three scenarios as well as a high CO_2 sensitivity in the Environmental Focus Scenario. In doing so, the Company believes that it covered a reasonable range of assumptions concerning possible carbon regulation.

Winter Peak Growth Rate (WOW)

Duke Energy Indiana Response:

The declining winter peak growth rate was a result of assuming that retail peaks grow at a slower rate than retail energy, as estimated by the latest peak regression models. Since winter retail energy is basically flat in Indiana, the model predicted a slightly declining winter peak. For capacity planning purposes, meeting the summer peak is the primary concern, so the validity of the modeling was not impacted.

Cost of Renewables (Citizen Groups)

Duke Energy Indiana Response:

Duke Energy Indiana's Renewables group develops the cost assumptions for renewable technologies based on industry-wide numbers. The cost of renewables was assumed to continue to decline through 2015. In the April stakeholder meeting, a range of approximately $1800 to $2300/kW was shown as an indication of the Company's internal assumption for wind capacity which encompassed the EIA AEO and DOE/LBL estimates. The actual analysis performed during the summer utilized a value at the lower end of the range.

Edwardsport

Duke Energy Indiana Response:

Edwardsport is a new plant and, as with most new plants, there is a period of time where the unit is tuned to steady state operations. Duke Energy Indiana has discussed this numerous times in testimony, stating that the Company expected the plant to work up to its projected ongoing level of availability (on coal and/or natural gas) of 85% over the first 15 months of operations. As the Company gains more experience with the plant, the inputs into the 2015 IRP will be updated to reflect the then-current forecasts of O&M and operating characteristics.

RESOURCE OPTIONS

CHP, Out-of-State Wind (multiple stakeholders)

Duke Energy Indiana Response:

Similar to Duke Energy Indiana's response to Dr. Borum's comments concerning DG, the IRP modeling does not require that solar, for example, be utility scale or DG. The placeholders for wind, solar and biomass also can be viewed as proxies for combined heat and power (CHP). Outside of the IRP and on a tactical level, the cost effectiveness of specific CHP and out-of-state wind projects will be considered.

EE (Citizen Groups)

Duke Energy Indiana Response:

See response to IURC comments.

<u>MODELING</u>

Transmission/Distribution Benefits (HEC)

Duke Energy Indiana Response:

Transmission and distribution impacts are very location-specific and are factored into the analysis of a specific project when final decisions are made. Out of necessity, the IRP analysis uses generic costs and benefits for transmission and distribution.

Renewables (Citizen Group, HEC)

Duke Energy Indiana Response:

Renewables in the IRP were allowed to compete based on economics. The renewable minimums in each scenario were a floor and serve as a proxy for a federal RPS. When renewables were not cost effective in a given year, the minimum amount of renewables required for that year was added. When renewables were cost effective, the model was allowed to add more than the minimum required amount of renewables. As an example, a large amount of wind is added in the early 2030s in response to higher carbon prices at that time and into the remainder of the modeling period.

Sensitivities (Citizen Groups)

Duke Energy Indiana Response:

Sensitivities need to be viewed in conjunction with the assumptions covered by the scenarios. Generally speaking, as the number of internally consistent scenarios increase, the incremental value of sensitivities is lessened. The reason for this is that the correlation between the variables is modeled within internally consistent scenarios. For this reason, Duke Energy Indiana believes that scenarios provide a more accurate picture than sensitivities in which only one variable is changed. Sensitivities provide some insight into the risk or impact on changes in a key variable to a particular portfolio. Re-optimizing portfolios in a sensitivity creates another portfolio for a set of assumptions that do not have the internal consistency of a scenario. It is preferable to test the responsiveness of a portfolio to a change in a variable to gain insight regarding that particular portfolio.

As previously discussed, IRP portfolios are for planning purposes. When a resource decision is required, another analysis will be performed using up-to-date information.

Gas-Coal Ratios (Citizens Groups)

Duke Energy Indiana Response:

Regarding the ratio of gas and coal prices used in the sensitivities, each fuel has its respective volatilities and relationships. In order to develop sensitivities for each fuel, Duke Energy Indiana evaluated nine contemporary gas price forecasts by leading energy consultants. The uncertainty band chosen was two standard deviations above and below the mean for the group. The Duke Energy fundamental gas price is above the average of the selected reference group due to different assumptions about coal retirements, the outlook for CO_2 prices, and the dates at which the forecasts were published. The high coal sensitivity relative to the Duke Energy Fundamental Forecast is +25%; the low sensitivity is -15%. This sensitivity range was arrived at by comparing the 2013 Duke Energy Fundamental Forecast base case with contemporary basin level forecasts (2012 and 2013) of multiple nationally recognized energy advisory groups (EIA, EVA, PIRA, Wood-Mackenzie).

Stakeholders took exception to the result that in the Environmental Focus scenario coal prices fall more than natural gas prices. The Company's fundamental modeling process looks at the supply and demand for fuels to determine prices. The Environmental Focus scenario features a relatively high carbon price that reduces the demand for coal-fired generation. As a result of less demand for coal, coal prices fall.

Natural gas is more complicated. While it is true that the presence of a carbon price will add cost to gas-fired generation and result in reduced demand for natural gas, replacing the energy that was previously generated by coal units is met, in part, by natural gas generation. The combination of these effects result in natural gas prices not falling as much as coal prices in this scenario.

IV. Conclusion

Duke Energy Indiana's IRP process, assumptions, and methodologies were reasonable, especially in light of the fact that the IRP is a planning document meant to provide insights into the future rather than acting as decisional document. Duke Energy Indiana appreciates the opportunity to address comments provided by Dr. Borum and stakeholders to further the understanding of the Company's 2013 IRP.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing reply comments were mailed electronically this 31st day of March, 2014, to the following:

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Dated this 31st day of March, 2014.

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